Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, July 28, 2016 8:26 AM
To: 'Tim Baker'; Virginia Hullinger; Patricia Downey; Charles Lord; Tony Cupp
Cc: Charles Lord; Patricia Downey
Subject: RE: Diesel question

No, so I assumed my summary was correct. If not please let me know ASAP! I don't want to put incorrect words in anyone's mouth. ☺

From: Tim Baker [mailto:T.Baker@occemail.com]
Sent: Wednesday, July 27, 2016 9:38 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Virginia Hullinger <V.Hullinger@occemail.com>; Patricia Downey <P.Downey@occemail.com>; Charles Lord <C.Lord@occemail.com>; Tony Cupp <T.Cupp@occemail.com>
Cc: Charles Lord <C.Lord@occemail.com>; Patricia Downey <P.Downey@occemail.com>
Subject: RE: Diesel question

Still getting caught up on being out for two weeks, did you get an answer to this question.

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, July 07, 2016 2:13 PM
To: Virginia Hullinger; Patricia Downey; Charles Lord; Tim Baker; Tony Cupp
Subject: RE: Diesel question

Hello again folks,

Just to be clear, R6 is collecting our State UIC Agency responses to the following questions. We will then summarize the results and pass it on to HQ before August 5, 2016.

1. What regulatory or other "controls" are in place regarding the use of diesel fuels in hydraulic fracturing since EPA issued the DFHF guidance and memo?
2. Have there been plans for or documented incidences of diesel fuel use? If so, what was the outcome of addressing such incidences - permitting, enforcement, alternative chemical use, etc.?

The goal is to determine whether diesel fuels are used in hydraulic fracturing activities; and, if so, whether the EPA, states and tribes are issuing permits in accordance with the SDWA and UIC regulations.

HQ plans to make the summary of both State and EPA DI program responses available on its website for public review. EPA takes this action in response to its Office of Inspector General investigation of the Safe Drinking Water Acts regulation of diesel fuel use in hydraulic fracturing activities.

Is the following a correct summary please?

Based on our conversations, OCC does not currently have a regulation discussing diesel usage in hydraulic fracturing. OCC rules require operators to report through FracFocus the base fluid and chemicals used. It has been at

least a year since FracFocus was last reviewed at that time one well had used kerosene, and 26 or so wells had used bioballs.

Thank you for your assistance, if you have any questions please don't hesitate to call me.

Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
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http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
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Dorsey, Nancy

From: Julie Shemeta <julie@meqgeo.com>
Sent: Wednesday, July 13, 2016 9:24 AM
To: 'Jim Marlatt'; Dorsey, Nancy; 'Phillip Bailey'; 'Ron Clymer'; 'Vicente Vasquez'
Cc: 'Charles Lord'; 'Tim Baker'
Subject: RE: volume question
Attachments: removed.txt; July Update-MEQGeo.pptx

Hi Jim,
Thanks for the update data and sorry to hear Tim is out sick (I hope you feel better soon!). Here are a few slides I made last week, using not-quite-complete database, but am holding off any more work until I have a chance to catch up with everyone.
Cheers,
Julie

From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Wednesday, July 13, 2016 8:17 AM
To: Jim Marlatt <J.Marlatt@occemail.com>; Julie Shemeta <julie@meqgeo.com>; 'Dorsey, Nancy' <Dorsey.Nancy@epa.gov>; Phillip Bailey <P.Bailey@occemail.com>; Ron Clymer <R.Clymer@occemail.com>; Vicente Vasquez <V.Vasquez@occemail.com>
Cc: Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>
Subject: RE: volume question

All,

Tim has been out sick and I have not had a chance to talk to him about any of this. We will need to reschedule the call to next week. I will send a new request once I have talked to Tim.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com

From: Jim Marlatt
Sent: Thursday, July 07, 2016 12:36 PM

To: 'Julie Shemeta'; 'Dorsey, Nancy'; Phillip Bailey; Ron Clymer; Vicente Vasquez
Cc: Charles Lord; Tim Baker
Subject: RE: volume question

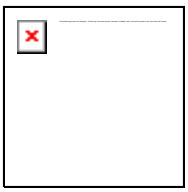
Julie,

We can do a conference call next week, and Wednesday afternoon looks good on this end. I will get the details together and send out a meeting request Monday, after I have a chance to talk to Tim about a few pieces of this puzzle.

Email to ogvolumes@occemail.com is the best way to communicate the issues found in the databases. We all receive that email and can get it to the appropriate team. Many of the issues fall outside the purview of the seismicity team, and we do not want anyone to feel left out.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Wednesday, July 06, 2016 9:36 AM
To: 'Dorsey, Nancy'; Jim Marlatt; Phillip Bailey; Ron Clymer; Vicente Vasquez
Subject: RE: volume question

Hi all,
Jim, et al., would it be possible to set up a conference call to discuss and get the most up-to-date information on the various injection databases? I am curious how the various updates are kept and how to access the most up to date files. And if we do have questions or find issues with a particular well/fluid, volume, etc… what is the best way to communicate?
Thanks,
Julie

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, July 06, 2016 8:28 AM
To: Jim Marlatt <J.Marlatt@occemail.com>; Phillip Bailey (P.Bailey@occemail.com) <P.Bailey@occemail.com>; Ron Clymer (R.Clymer@occemail.com) <R.Clymer@occemail.com>; Vicente Vasquez <V.Vasquez@occemail.com>
Cc: Julie Shemeta <julie@meqgeo.com>
Subject: volume question

I was going through my (old) copy of the 2000-2014 volumes, deleting duplicates and marking the CO2 entries so I can separate them from the SW. Which works fine, when there is an image of the F1012 indicating which is which. But

there are very few images between 2003 and 2008. Was there any column indicating the fluid entered in the old data? Or do you have the images some place?

Some of these are not inside the reduction area. At least I don't think the Camerick Unit is.

Thanks,
Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

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Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, July 13, 2016 8:08 AM
To: Patricia Downey; Charles Lord
Cc: Tim Baker; Dellinger, Philip
Subject: draft OCC 2015 EOY
Attachments: OCC 2015 Draft EOY .docx

Greetings!

Please read over the attached draft of our 2015 FY end-of-Year review, and let me know if you have any concerns. If you could let me know by July 27th, that would be great. We do understand that some of the issues have changed during this year passed the extended time covered on seismicity. Hopefully, the one for 2016 will be easier to complete!

Regards,
Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, July 07, 2016 2:13 PM
To: 'Virginia Hullinger'; Patricia Downey; Charles Lord; Tim Baker; Tony Cupp
Subject: RE: Diesel question

Hello again folks,

Just to be clear, R6 is collecting our State UIC Agency responses to the following questions. We will then summarize the results and pass it on to HQ before August 5, 2016.

1. What regulatory or other "controls" are in place regarding the use of diesel fuels in hydraulic fracturing since EPA issued the DFHF guidance and memo?
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HQ plans to make the summary of both State and EPA DI program responses available on its website for public review. EPA takes this action in response to its Office of Inspector General investigation of the Safe Drinking Water Acts regulation of diesel fuel use in hydraulic fracturing activities.

Is the following a correct summary please?
Based on our conversations, OCC does not currently have a regulation discussing diesel usage in hydraulic fracturing. OCC rules require operators to report through FracFocus the base fluid and chemicals used. It has been at least a year since FracFocus was last reviewed at that time one well had used kerosene, and 26 or so wells had used bioballs.

Thank you for your assistance, if you have any questions please don't hesitate to call me.

Nancy

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, July 06, 2016 2:24 PM
To: 'Virginia Hullinger'
Cc: Patricia Downey; Charles Lord; Tim Baker; Tony Cupp; Dellinger, Philip
Subject: RE: Diesel question

Hi Virginia,

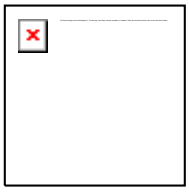
Thank you for a reply, though I am a bit confused how diesel is not allowed, if it is not in the rules and there is no application process?

Thank you for your clarification!
Nancy

From: Virginia Hullinger [mailto:V.Hullinger@occemail.com]
Sent: Wednesday, July 06, 2016 2:20 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Patricia Downey <P.Downey@occemail.com>; Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Tony Cupp <T.Cupp@occemail.com>
Subject: RE: Diesel question

Nancy,
We do not have any new rules this year with respect to diesel fuels being used during hydraulic fracturing. We do not allow diesel fuel use in hydraulic fracturing therefore we do not track usage for diesel fuels in fracs. However we require all wells hydraulically fractured to report to FracFocus requiring information on the chemicals and base fluid used.
Regards,

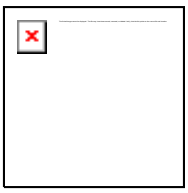
Virginia Hullinger
Oklahoma Corporation Commission
Oil & Gas Conservation Division
Technical Services Manager
(405) 522-4451
v.hullinger@occemail.com



From: Patricia Downey
Sent: Wednesday, July 06, 2016 12:52 PM
To: Virginia Hullinger
Subject: FW: Diesel question

This may be one for you to answer

Patricia J. Downey
Manager, Underground Injection Control
Oklahoma Corporation Commission
P.O. Box 52000
Oklahoma City, OK 73152
405-522-2745
Fax 405-521-3099



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, July 06, 2016 12:45 PM
To: Tim Baker; Patricia Downey; Charles Lord
Cc: Matt Skinner
Subject: Diesel question

Hi folks,

Double checking for headquarters, on whether OCC has done any rulemaking, or internal procedures, along the lines of EPA's guidance with respect to diesel fuels during hydraulic fracturing? Also, whether or not the OCC tracks any such diesel fuel usage?

Thank you,
Nancy

Nancy S. Dorsey
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Dorsey, Nancy

From: Julie Shemeta <julie@meqgeo.com>
Sent: Friday, July 01, 2016 1:48 PM
To: 'Phillip Bailey'
Cc: Dorsey, Nancy; 'Jim Marlatt'
Subject: RE: QC tool?
Attachments: removed.txt; CUMULATIVE 2000-2015 no-tabs-1July.xlsx

Okay, here is a link to monster spreadsheet (with a ton of tabs for all the data sources).
https://files.acrobat.com/a/preview/5e44ca70-d1d9-4bf5-9a59-bfd0e1733910

And attached to this email is a simple excel file with the current version of 2000-2015 summary data compiled so far.

Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, July 01, 2016 8:13 AM
To: Julie Shemeta <julie@meqgeo.com>
Cc: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Jim Marlatt <J.Marlatt@occemail.com>
Subject: RE: QC tool?

I've downloaded the file and copied it to your folder (JShemata). This QC work helps greatly that you have been doing. In the process, we've discovered other issues that have come to light. We're working through them as we get them.

Attached is the list of wells with their respective reduction area as well as their reduction schedule (by API).

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Wednesday, June 29, 2016 1:38 PM
To: Phillip Bailey
Cc: Dorsey, Nancy; Jim Marlatt
Subject: QC tool?

Hi all,
Okay, as I am going crazy trying to create master spreadsheet and classify the wells (AOI, COK, etc) …as not all the yearly data spreadsheets have data for every well and every year.

So, I created a new spreadsheet that might help figure out missing data areas for the more important wells.

A link to the sheet is here https://files.acrobat.com/a/preview/fda32aca-9a1e-413a-b836-083412c69b60 it is too big to email and I do not have permission to write files on the OCC FTP site.

I took all the injection data from 2008 to 2015, computed cumulative volumes for each, then created a list of unique API numbers that exist a spreadsheet anywhere from 2008-2015. For each well, the cumulative volume for year is listed. Any well in the OCC Cam/Ord is listed too (with its KB and TD).

This summary sheet should help find years for the "big wells" or CamOrd wells that have data missing for a particular year. A blank means for that year, data is missing, while a "0" is zero cum volume for that year. I highlighted a few of these "potential missing data" areas in bright yellow on the first tab.

I am now working on doing this going back to year 2000, this was an experiment…

Phillip, if there is a list of COK, WOK, AOI, Etc well classifications by API, I can add these to this spreadsheet, and then I can add them to the monthly total spreadsheets…. Etc.

Thanks,
Julie

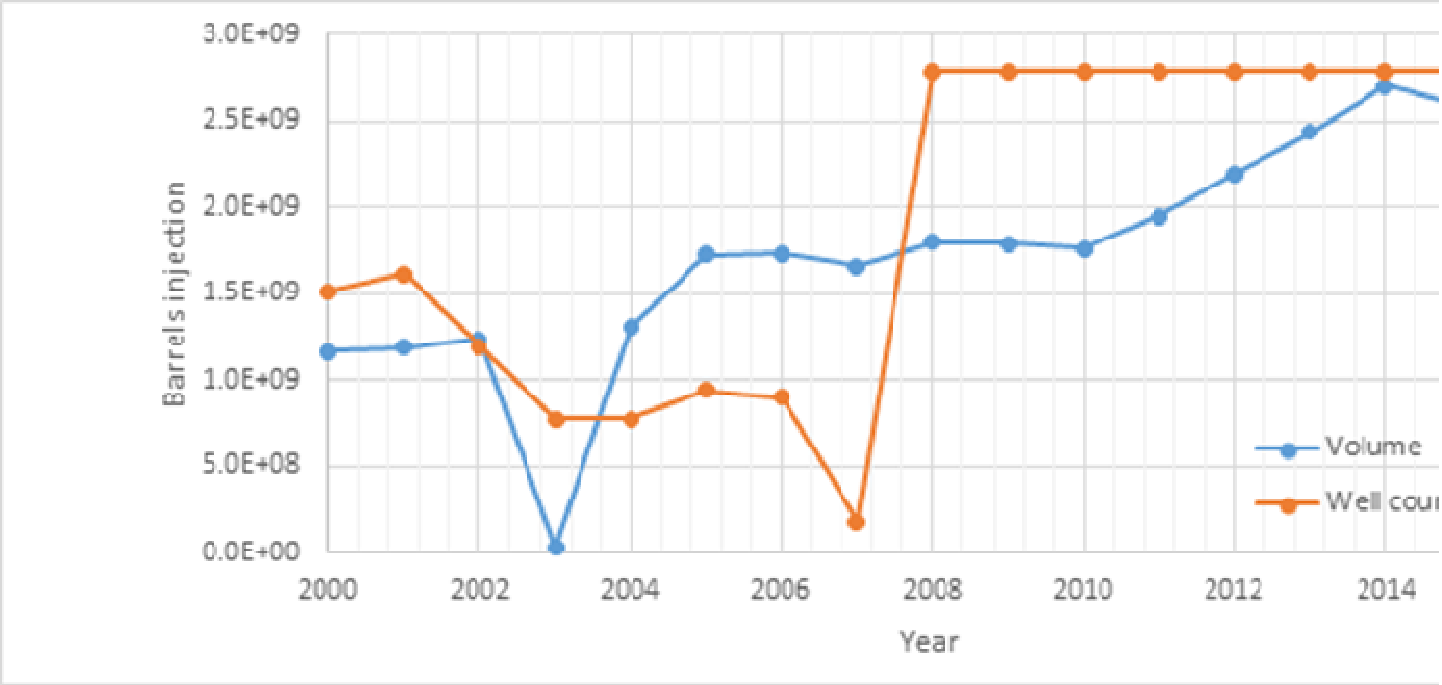
Julie Shemeta
MEQ Geo Inc.
Microseismic Consulting and Services
Littleton, CO
Cell +1 (303) 910-0760
julie@meqgeo.com
www.meqgeo.com

Dorsey, Nancy

From: Julie Shemeta <julie@meqgeo.com>
Sent: Friday, July 01, 2016 1:38 PM
To: 'Phillip Bailey'
Cc: Dorsey, Nancy; 'Jim Marlatt'
Subject: RE: QC tool?

Hi Phillip,
I will send via Adobe the updated spreadsheet with 2000-2015. There are a LOT of tabs on this, but I put the summary on the first tab, the subsequent tabs are the tabs with formula/index-match, etc. to create the master sheet. I tried to find lat, lon, kb and td for all these wells, but was not always successful. There are kb and td in the cam-ord spreadsheet and I had data from I.H.S. that you provided.

A quick summary graph is here…which highlights years to review (volumes in 2003 and number of wells in 2007?).
Have a great 4th weekend everyone…
Julie



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Cc: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Jim Marlatt <J.Marlatt@occemail.com>
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Subject: QC tool?

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Julie

Julie Shemeta
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Microseismic Consulting and Services
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julie@meqgeo.com
www.meqgeo.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, June 29, 2016 3:39 PM
To: 'Phillip Bailey'
Subject: RE: Arbuckle study

Hi Phillip,

I was working with amalgamating data into my Access DB. What is the column headed permit date please? From what I have seen so far, it is NOT the date of the permit or order listed.

Thanks,
Nancy

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, June 24, 2016 10:03 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Jim Marlatt <J.Marlatt@occemail.com>; Ron Clymer <R.Clymer@occemail.com>; Vicente Vasquez <V.Vasquez@occemail.com>; Charles Lord <C.Lord@occemail.com>
Subject: FW: Arbuckle study

Hi Nancy,

I've attached a spreadsheet that was compiled from our team's Access DB. The data is for all disposal/injection wells in Oklahoma that have TD'd in Cambrian-Ordovician age rock units. We've come across a handful of wells that were not actual injection wells. This is still a works in progress but we can quickly grab the data we commonly need. Again, this is not a complete DB yet (as you can see). I used the OrderNumbers/Permit lookups that had in a table. Let me know if you have any questions with any of the fields.

Work being done:

1. We have created regional structure maps (Oklahoma) of the top of the Arbuckle and top of basement. We will look to create other shallower horizon structure maps in the near future.
2. We have not created an Arbuckle reservoir pressure or temperature map. I have not come across readily accessible data for either **except** there is an OSU initiative (Todd Halihan and student) to study the ***Piezometric Evolution of Seismically Active Arbuckle Fluid Disposal Zone***. This study is getting 'off the ground now'. Also, there has been work done in the 90's I believe by James Puckette of OSU. I believe it was his thesis. I included a figure of his below but please only use as reference for now. I'm not sure of copyright infringements or anything of that nature.

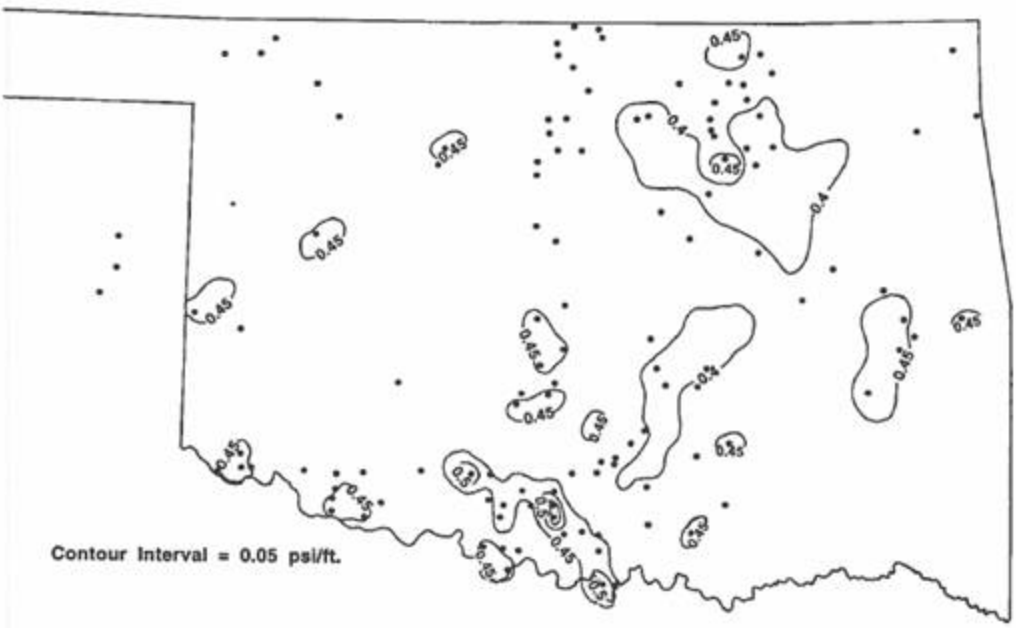

Figure 58. Pressure-depth gradient map of the Arbuckle Group. The similar p-d gradient values indicate the Arbuckle is a regional aquifer that maintains hydraulic continuity and pressure communication with the outcrop recharge areas.

3. The "Traffic Light" wells that have been required to run BHP surveys have been compiled. We also have a list of those wells (attached). The reports are scanned and in pdf form. I can give you the path (should have access, I think)
    a. R:\county_cov\Swarm Volume Data_Bulk Folder\To RBDMS
        i. Files in this folder are named with the well's 8-digit API and the general type of log or report. In this case search for "BHP" to get a quick listing of all we have compiled reports for. I believe Todd Halihan and co. are going to create a database of this…

Let's talk more about the current studies being done soon.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, June 23, 2016 10:22 AM
To: Jim Marlatt; Phillip Bailey; Ron Clymer; Vicente Vasquez
Subject: Arbuckle study

Hi folks,

I haven't chatted with you in a while. Before I start on something you have already done, I thought it wise to touch base.

I know you are working on the regional formation structure maps. Have you already pulled together any kind of Arbuckle reservoir pressure map? And do you have any kind of reservoir temperature information? I sent an e-mail to Charles asking where the pressures are being loaded – for the few wells that are required to run either BHP surveys or depth to water. I hope they are now all scanned. ☺

Julie had put William Yeck (USGS, post-doc seismologist) and Matthew Weingarten (Stanford, post-doc hydrologist) in touch with me. We chatted last week. As you probably already know, they are working on different aspects of the Regional Arbuckle picture. A rock mechanics simulation model at Stanford, and a slip model at USGS to help with refining their Ground Motion Prediction Model, plus improving the depth estimates and locations of the events. Apparently, the Fairview large event was deeper than most of the other Oklahoma events.

Regards,
Nancy

Nancy S. Dorsey
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Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Hi folks,

I just noticed a bad query that I used to generate my list of UIC wells drilled into or below the Arbuckle. This is the revised copy. However, I haven't updated my well list in a while. Do you (at OCC) have a more recent list of UIC wells, please? Would you either point me to it or send me a copy?

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, June 29, 2016 3:00 PM
To: 'Vicente Vasquez'; James Phelps; Jim Marlatt; Phillip Bailey; Ron Clymer
Cc: Patricia Downey; Charles Lord
Subject: RE: F1002a disposal into Arbuckle but no top for Arbuckle

Certainly one for the wish list—top of the formation being disposed into. I don't believe it is even on the application, though operators usually put the top formation as the top interval. (I think!?) ☺

Will do, and thanks!
Nancy

From: Vicente Vasquez [mailto:V.Vasquez@occemail.com]
Sent: Wednesday, June 29, 2016 2:57 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; James Phelps <J.Phelps@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>; Phillip Bailey <P.Bailey@occemail.com>; Ron Clymer <R.Clymer@occemail.com>
Subject: RE: F1002a disposal into Arbuckle but no top for Arbuckle

Nancy,

Getting formation records form the operators is a definite goal of ours and something we've had to ask for on a per case basic if we cannot find information on the 1002a – currently I am not aware of a standard requiring operators to provide ___ data when calling (or not calling) tops in disposal zones. This is a goal of ours as well.

We have collected other top information from sources outside of the 1002a though, so send me over a list and I can fill in the gaps, or pursue resolution on missing data.

Thanks!

Vicente Vasquez
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard
Oklahoma City, OK 73105
(405) 522-2802
v.vasquez@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, June 29, 2016 2:20 PM
To: James Phelps; Jim Marlatt; Phillip Bailey; Ron Clymer; Vicente Vasquez
Subject: F1002a disposal into Arbuckle but no top for Arbuckle

Hi all,

I notice that a handful of operators (Range in particular) have filed F1002A for disposal into the Arbuckle, but do not provide the top of the Arbuckle. Most if they list a top stop in the Mississippi. A number of these likewise did not provide any logs at all.

If I can provide a list, any chance of getting the tops?

Thanks,
Nancy

Nancy S. Dorsey
Environmental Scientist
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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, June 23, 2016 11:35 AM
To: 'Charles Lord'
Cc: Jim Marlatt
Subject: RE: seismicity app resolution?
Attachments: OWSM_ArbWells_06-23-2016_NSD.xlsx

I revised the permits into their own columns and deleted all the duplicates and triplicates, plus removed the obvious PDs to its own column. For what it is worth, you may have a copy back. ☺

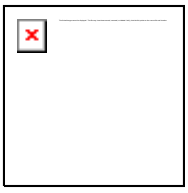
From: Charles Lord [mailto:C.Lord@occemail.com]
Sent: Thursday, June 23, 2016 10:40 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: seismicity app resolution?

Here is a list of 700 wells in our AOI.

If they have not filed a 1012d or if we did not add a zero 1012d it will not be in this shapefile.

There are 700.

Charles Lord
Senior Hydrologist
Oklahoma Corporation Commission
Post Office Box 52000
Oklahoma City, Oklahoma 73152
(405)522-2751
c.lord@occemail.com



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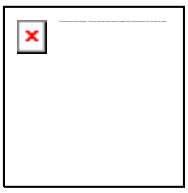

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Attachments: removed.txt; OWSM_ArbWells_06-23-2016.cpg; OWSM_ArbWells_06-23-2016.dbf; OWSM_ArbWells_06-23-2016.prj; OWSM_ArbWells_06-23-2016.sbn; OWSM_ArbWells_06-23-2016.sbx; OWSM_ArbWells_06-23-2016.shp; OWSM_ArbWells_06-23-2016.shx

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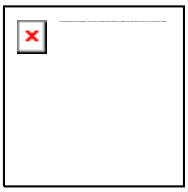

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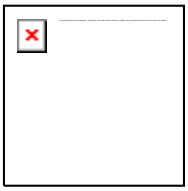

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From: Dorsey, Nancy
Sent: Thursday, June 23, 2016 10:22 AM
To: Jim Marlatt; Phillip Bailey (P.Bailey@occemail.com); Ron Clymer (R.Clymer@occemail.com); Vicente Vasquez
Subject: Arbuckle study

Hi folks,

I haven't chatted with you in a while. Before I start on something you have already done, I thought it wise to touch base.

I know you are working on the regional formation structure maps. Have you already pulled together any kind of Arbuckle reservoir pressure map? And do you have any kind of reservoir temperature information? I sent an e-mail to Charles asking where the pressures are being loaded – for the few wells that are required to run either BHP surveys or depth to water. I hope they are now all scanned. ☺

Julie had put William Yeck (USGS, post-doc seismologist) and Matthew Weingarten (Stanford, post-doc hydrologist) in touch with me. We chatted last week. As you probably already know, they are working on different aspects of the Regional Arbuckle picture. A rock mechanics simulation model at Stanford, and a slip model at USGS to help with refining their Ground Motion Prediction Model, plus improving the depth estimates and locations of the events. Apparently, the Fairview large event was deeper than most of the other Oklahoma events.

Regards,
Nancy

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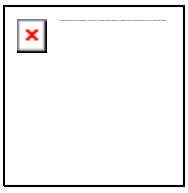

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Tuesday, June 21, 2016 8:24 AM
To: Murray, Kyle E.
Subject: Arbuckle analysis?

Hi Kyle,

Do you have a publication or information mapping out the Arbuckle particularly with reference to literal maps, thickness, and reservoir temperature or pressure? That you would be willing to share?

Thanks,
Nancy

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Dorsey, Nancy

From: Yeck, William <wyeck@usgs.gov>
Sent: Monday, June 20, 2016 12:54 PM
To: Dorsey, Nancy
Subject: Re: re call yesterday
Attachments: Stein, King, Lin - 1992 - Science.pdf

This article is a good starting point, and was one of the first publications on the topic.

On Mon, Jun 20, 2016 at 11:25 AM, Dorsey, Nancy <Dorsey.Nancy@epa.gov> wrote:

> Thanks Will!
>
> Can you recommend a publication on the current theory of the modeling…suitable for a geologist ☺ ?
>
> Thanks again,
>
> Nancy
>
> **From:** Yeck, William [mailto:wyeck@usgs.gov]
> **Sent:** Monday, June 20, 2016 12:14 PM
> **To:** Dorsey, Nancy <Dorsey.Nancy@epa.gov>
> **Subject:** Re: re call yesterday
>
> Hi Nancy,
>
> Let me preface this by saying this is preliminary. Once I have a peer-reviewed document I will pass it on to you.
>
> The earthquakes occur on a lineation ~14 km long in the crystalline basement. Our well constrained depth estimates put these earthquakes ~6-10 km below sea-level, which is slightly deeper than some of the other sequences in OK. Aftershocks primarily occur to the southwest of the epicenter of the M 5.1 event, while to the northeast of this event we see less aftershocks.

For earthquakes large enough to estimate a moment tensor solution (focal mechanism), we constantly see that slip is most likely occurring on a right-lateral strike slip fault, striking to the northeast. This is consistent with the strike of previously mapped faults. Many of these events are occurring on a portion of a fault that was previously unmapped.

If we look at stress modeling, the aftershock locations are best explained by the M.51 slipping to the NE of its hypocenter. This explains the aseismic region we observed NE of the mainshock. The rupture area predicted by this aseismic zone is consistent with what we may expect of this size.

Will

On Fri, Jun 17, 2016 at 2:53 PM, Dorsey, Nancy <Dorsey.Nancy@epa.gov> wrote:

> Thank you for inviting me to chat with you both about the Fairview area seismicity.
>
> Will, I you could recommend a (simple version) describing the current thinking on the slip epicenter and fore shock after shock modeled locations, I would appreciate it!
>
> I think from a couple of Matt's remarks that perhaps I should have given a better introduction to the (modified) Hall plots. So for a better reference, this is NOT something we invented (we do not do research in our group), it has been around the oil patch for decades in one form or another. SPE has a lot of publications, particularly for waterflood issues.
>
> The footnotes on the graphs are standard, with the exception of the first event years ago all the operational data corresponding with the seismicity was recorded daily.
>
> On the rapidly changing permeability point, I was not clear the change reflects transmissibity combined with any skin (kh over viscosity with skin). It does in fact show a good reflection of a typical well response in a fairly tight matrix with fracture network. I.e. resistance in the tight matrix, until access to better porosity-feet or a fracture is found. Considering the section of open hole involved, part of the splash character of the injection pressure and volume, may also reflect how much of the formation is accepting fluids.

Comparing that type of well behavior to a homogenized poro-perm reservoir isn't going to work very well because of the scaling that has been used, along with the mix of injector wellbore types (I.e. horizontal, deviated and vertical). Unless of course modelling has come a really long way, which is possible.

Simulation modeling methods whether for use with seismicity or CO2 sequestration is probably the 'hot engineering' topic comparable to the seismological debate on induced seismicity character. Not my expertise, but from the work applications both at EPA and in industry, I definitely see the need for the appropriate level of detail side, (anisotropy, varied fracture density, etc.). On the slight chance you aren't already familiar with the various ins and outs of the debate, it might be worth your time to scan through the SPE 'discussions' between Nicot and Economides with respect to a regional CO2 sequestration modeling effort. An a related issue, you might want to check out *Understanding the Correlation Between Induced Seismicity and Water Injection in the Fort Worth Basin*, by Gono et al. It was given at the AAPG Annual Convention in June 2015, and later posted online. The authors used a regional scale rock mechanics reservoir simulation model for the analysis. Unfortunately, the scale and requisite lack of geologic or formation detail probably caused the 'weak spatial and temporal correlation between the location of the earthquakes and the area of increased pore pressure.' If you can avoid similar pitfalls, it will strengthen your case.

Regards,

Nancy

Nancy S. Dorsey

Environmental Scientist

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--

William Yeck
USGS NEIC
Postdoctoral Researcher
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--

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Simulation modeling methods whether for use with seismicity or CO2 sequestration is probably the 'hot engineering' topic comparable to the seismological debate on induced seismicity character. Not my expertise, but from the work applications both at EPA and in industry, I definitely see the need for the appropriate level of detail side, (anisotropy, varied fracture density, etc.). On the slight chance you aren't already familiar with the various ins and outs of the debate, it might be worth your time to scan through the SPE 'discussions' between Nicot and Economides with respect to a regional CO2 sequestration modeling effort. An a related issue, you might want to check out *Understanding the Correlation Between Induced Seismicity and Water Injection in the Fort Worth Basin*, by Gono et al. It was given at the AAPG Annual Convention in June 2015, and later posted online. The authors used a regional scale rock mechanics reservoir simulation model for the analysis. Unfortunately, the scale and requisite lack of geologic or formation detail probably caused the 'weak spatial and temporal correlation between the location of the earthquakes and the area of increased pore pressure.' If you can avoid similar pitfalls, it will strengthen your case.

Regards,

Nancy

Nancy S. Dorsey

Environmental Scientist

Oklahoma Class II Program Manager

WQ-SG EPA Region 6

1445 Ross Ave. #1200

Dallas, TX 75202-2733

214-665-2294

FAX 214-665-2191

UIC Webpages:

http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx

http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions

Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

--

William Yeck
USGS NEIC
Postdoctoral Researcher
wyeck@usgs.gov

Dorsey, Nancy

From: Hildebrandt, Kurt
Sent: Monday, June 20, 2016 10:12 AM
To: Dorsey, Nancy
Subject: RE: KDHE Initiatives - Class I Well Seismic Monitoring, Injection Volume Minimization

It isn't in the bag (so to speak) just yet. This is the kick-off meeting. There have been concerns from some of the operators that they "have been injecting for 50 years without an issue" and why do this now. Potential liability comes to mind but if there's anyone who can make this happen, it's Mike. Fingers crossed on our end.

From: Dorsey, Nancy
Sent: Monday, June 20, 2016 10:06 AM
To: Hildebrandt, Kurt <Hildebrandt.Kurt@epa.gov>
Subject: re: KDHE Initiatives - Class I Well Seismic Monitoring, Injection Volume Minimization

Way to go KDHE!

From: Graves, Brian
Sent: Monday, June 20, 2016 8:55 AM
To: Dellinger, Philip <dellinger.philip@epa.gov>; Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Overbay, Michael <overbay.michael@epa.gov>; Bierschenk, Arnold <bierschenk.arnold@epa.gov>; Johnson, Ken-E <Johnson.Ken-E@epa.gov>
Subject: FW: KDHE Initiatives - Class I Well Seismic Monitoring, Injection Volume Minimization

---

From: Hildebrandt, Kurt
Sent: Monday, June 20, 2016 8:43 AM
To: Graves, Brian <Graves.Brian@epa.gov>
Subject: FW: KDHE Initiatives - Class I Well Seismic Monitoring, Injection Volume Minimization

FYI – Here's the latest on the KS C1 IS initiative. Mike will be talking more at the R7 EPA/State UIC reps meeting this week. If he has anything more to offer, I'll pass it along.

From: Mike Cochran [mailto:mcochran@kdheks.gov]
Sent: Monday, June 20, 2016 6:47 AM
To: Garrett, David <Garrett.David@epa.gov>; Hildebrandt, Kurt <Hildebrandt.Kurt@epa.gov>; Mindrup, Mary <Mindrup.Mary@epa.gov>
Subject: FW: KDHE Initiatives - Class I Well Seismic Monitoring, Injection Volume Minimization

FYI. Sent last Friday afternoon to our Class I operators.

Mike,

From: Mike Cochran
Sent: Friday, June 17, 2016 3:54 PM
To: 'ddick@eprod.com' <ddick@eprod.com>; 'jswilley@frontieroil-eld.com' <jswilley@frontieroil-eld.com>; 'donk@hutchgov.com' <donk@hutchgov.com>; 'mchisam@kansasethanol.net' <mchisam@kansasethanol.net>;

'StuckyGE@kochind.com' <StuckyGE@kochind.com>; 'ewillse@mortonsalt.com' <ewillse@mortonsalt.com>; 'bryansmith@mortonsalt.com' <bryansmith@mortonsalt.com>; 'avogelsberg@ncra.coop' <avogelsberg@ncra.coop>; 'jay.koehn@nngco.com' <jay.koehn@nngco.com>; 'Lloyd.choitz@nngco.com' <Lloyd.choitz@nngco.com>; 'alan.raupe@oneok.com' <alan.raupe@oneok.com>; 'bstephens@oneok.com' <bstephens@oneok.com>; 'fred.nelson@oneok.com' <fred.nelson@oneok.com>; 'srob@hughes.net' <srob@hughes.net>; 'jlikes@redbarninc.com' <jlikes@redbarninc.com>; 'steve.morisse@regencygas.com' <steve.morisse@regencygas.com>; 'evsetecka@sunflower.net' <evsetecka@sunflower.net>; 'brian.bernaud@tyson.com' <brian.bernaud@tyson.com>; 'james.bohrer@tyson.com' <james.bohrer@tyson.com>; 'psmith@weci.net' <psmith@weci.net>; 'randy.heinrichs@williams.com' <randy.heinrichs@williams.com>; 'dbasham@deffenbaughinc.com' <dbasham@deffenbaughinc.com>; 'zellersc@kochind.com' <zellersc@kochind.com>; 'hill@compassminerals.com' <hill@compassminerals.com>; 'Rkotschegarow@oneok.com' <Rkotschegarow@oneok.com>; 'dennis.clark@regencygas.com' <dennis.clark@regencygas.com>; 'Eichorn, Gregg W.' <GEichorn@oneok.com>; 'McCall, Michael M.' <Michael.McCall@oneok.com>; 'Nancy_Thimmesch@oxy.com' <Nancy_Thimmesch@oxy.com>; 'tami.morton@oneok.com' <tami.morton@oneok.com>; 'marshallja@compassminerals.com' <marshallja@compassminerals.com>; 'Nicholas_Bell@oxy.com' <Nicholas_Bell@oxy.com>; 'Craig Pangburn' <craigp@tcmfg.com>; 'Steve Pangburn' <spangburn@ucsks.com>; 'Loveless, Rick' <Rick.Loveless@nngco.com>
Cc: Jaime C. Gaggero <JGaggero@kdheks.gov>; Tom Stiles <TStiles@kdheks.gov>; Rex Buchanan <rex@kgs.ku.edu>; 'Rick Miller' <rmiller@kgs.ku.edu>; Jessica Crossman <JCrossman@kdheks.gov>; Brandy DeArmond <BDeArmond@kdheks.gov>; Pam Chaffee <pchaffee@kdheks.gov>; Doug Doubek <ddoubek@kdheks.gov>; Allison Herring <AHerring@kdheks.gov>; Jennifer Nichols <JNichols@kdheks.gov>; Julie Coleman <jcoleman@kdheks.gov>; Erich Glave <EGlave@kdheks.gov>; Tracy Streeter <tracy.streeter@kwo.ks.gov>; Unruh, Matt <Matt.Unruh@kwo.ks.gov>; Kelsee Wheeler <Kelsee.Wheeler@kwo.ks.gov>; 'Nancy Larson' <nlarson@ksu.edu>
Subject: KDHE Initiatives - Class I Well Seismic Monitoring, Injection Volume Minimization

Good afternoon,

KDHE is holding a meeting with Class I disposal well operators at which KDHE will explain and discuss two KDHE initiatives in regards to Class I disposal wells and to obtain input from Class I disposal well operators. These initiatives are important and have impacts to Class I disposal wells.

This meeting will be held on July 28, 2016, in the Sunflower Room at the Sedgwick County Extension Education Center, 7001 W. 21st Street North, Wichita, Kansas. An agenda for this meeting is attached. Due to space limitations, we request each company send no more than three individuals to participate in the meeting. We would appreciate having the attached registration form completed for each individual participating in the meeting and submitted to KDHE on or before July 11, 2016.

The two initiatives are 1) the need for Class I injection operations to implement statewide seismic monitoring, and 2) the need to minimize the amount of wastewater injected into the subsurface.
These two initiatives are tied together because reducing the amount of wastewater injected is one of the factors that reduces the potential of inducing seismicity. Thus the relationship between the two initiatives.

As you most likely are aware, there has been a significant increase in seismic activity in south central Kansas and of course much activity just across the border into Oklahoma. Much of this activity has been attributed to deep well injection of brine wastewater resulting from oil production. This has resulted in much concern by the public, and in the cases of some the larger quakes, property damage. These Class II oilfield disposal wells are Arbuckle wells. The Kansas Geological Survey has observed that the seismic activity in Kansas seems to be migrating to the north over time. And, there has been activity near Cheney, Kansas, just to the west of Wichita.

The United States Geological Survey (USGS) has released information that affects the Class I injection well community. The information contained at this website is important: http://www.usgs.gov/blogs/features/usgs_top_story/induced-earthquakes-raise-chances-of-damaging-shaking-in-2016/ . Note that the United States Geological Survey has issued a one-year seismic hazard forecast map for the Central and Eastern United States, and for the first time this includes both human induced and natural earthquakes. The USGS Earthquake Damage Hazard map shows the earthquake shaking hazard extending into southcentral Kansas. The induced seismicity has been correlated at this time to the deep disposal of oilfield produced brine.

But there have also been incidents in other states that point towards induced seismicity being associated with Class I injection wells.

Our overarching view on injection induced seismicity is that KDHE desires the Class I injection well part of the KDHE UIC Program to be ahead of the game by being proactive in monitoring seismic activity. The Class I wells in Kansas use the same Arbuckle Formation for wastewater disposal. KDHE does not want Class I disposal operations to become part of the problem, wants to demonstrate Class I wells are not a problem and also wants to be able to be able to proactively address any third party concerns should they arise in the future.

The seismicity initiative ties into the other KDHE initiative which is to work with the Class I disposal well facilities to implement a voluntary program of minimizing the amount of wastewater injected and also the pollutants in the injected wastewater. In addition to conserving water and minimizing waste, reducing the volume of water injected can reduce the potential for inducing seismicity.

The attire for this meeting is casual. Jeans are acceptable!

If you have questions or need more information, please feel free to contact me.

Mike,

Mike Cochran
Professional Geologist
Chief, Geology and Well Technology Section
Bureau of Water
Kansas Department of Health and Environment
1000 SW Jackson Street, Suite 420
Topeka, KS 66612-1367
Telephone = 785.296.5560
Email = mcochran@kdheks.gov
Section Website = http://www.kdheks.gov/geo/index.html

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Friday, June 17, 2016 3:53 PM
To: Matthew Weingarten; Yeck, William
Cc: Julie Shemeta; Phil Dellinger (delling.p88@gmail.com); Johnson, Ken-E
Subject: re call yesterday

Thank you for inviting me to chat with you both about the Fairview area seismicity.

Will, I you could recommend a (simple version) describing the current thinking on the slip epicenter and fore shock after shock modeled locations, I would appreciate it!

I think from a couple of Matt's remarks that perhaps I should have given a better introduction to the (modified) Hall plots. So for a better reference, this is NOT something we invented (we do not do research in our group), it has been around the oil patch for decades in one form or another. SPE has a lot of publications, particularly for waterflood issues.

The footnotes on the graphs are standard, with the exception of the first event years ago all the operational data corresponding with the seismicity was recorded daily.

On the rapidly changing permeability point, I was not clear the change reflects transmissibity combined with any skin (kh over viscosity with skin). It does in fact show a good reflection of a typical well response in a fairly tight matrix with fracture network. I.e. resistance in the tight matrix, until access to better porosity-feet or a fracture is found. Considering the section of open hole involved, part of the splash character of the injection pressure and volume, may also reflect how much of the formation is accepting fluids.

Comparing that type of well behavior to a homogenized poro-perm reservoir isn't going to work very well because of the scaling that has been used, along with the mix of injector wellbore types (I.e. horizontal, deviated and vertical). Unless of course modelling has come a really long way, which is possible.

Simulation modeling methods whether for use with seismicity or CO2 sequestration is probably the 'hot engineering' topic comparable to the seismological debate on induced seismicity character. Not my expertise, but from the work applications both at EPA and in industry, I definitely see the need for the appropriate level of detail side, (anisotropy, varied fracture density, etc.). On the slight chance you aren't already familiar with the various ins and outs of the debate, it might be worth your time to scan through the SPE 'discussions' between Nicot and Economides with respect to a regional CO2 sequestration modeling effort. An a related issue, you might want to check out *Understanding the Correlation Between Induced Seismicity and Water Injection in the Fort Worth Basin*, by Gono et al. It was given at the AAPG Annual Convention in June 2015, and later posted online. The authors used a regional scale rock mechanics reservoir simulation model for the analysis. Unfortunately, the scale and requisite lack of geologic or formation detail probably caused the 'weak spatial and temporal correlation between the location of the earthquakes and the area of increased pore pressure.' If you can avoid similar pitfalls, it will strengthen your case.

Regards,
Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200

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FAX 214-665-2191

UIC Webpages:
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http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Charles Lord <C.Lord@occemail.com>
Sent: Monday, June 13, 2016 3:36 PM
To: Dorsey, Nancy
Subject: FW: 2016-04-07 22:27 Mw3.7 FPS
Attachments: 201604072227_Mw3.7.png

From: Chang, Jefferson C. [mailto:jeffersonchang@ou.edu]
Sent: Friday, April 08, 2016 10:43 AM
To: Charles Lord
Cc: Tim Baker; Boak, Jeremy M.
Subject: 2016-04-07 22:27 Mw3.7 FPS

Hi Charles,

We generated a well-constrained focal plane solution of the event, at it is strike slip as expected. Nothing out of the ordinary.

Jefferson

Dorsey, Nancy

From: Charles Lord <C.Lord@occemail.com>
Sent: Monday, June 13, 2016 3:27 PM
To: Dorsey, Nancy
Subject: FW: Presentation material 6_10_2016
Attachments: OGS ppt 6_10_2016.pptx; Seismicity Review-9June_update1.pptx

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From: Vicente Vasquez
Sent: Friday, June 10, 2016 12:12 PM
To: jboak@ou.edu
Cc: Tim Baker; Charles Lord; Jim Marlatt; Phillip Bailey; Ron Clymer; Martin Emery
Subject: Presentation material 6_10_2016

Dr. Boak,

Please find attached our ppt for today's meeting – I've included Julie Shemeta's recent presentation and we hope to have on a call during the meeting to discuss her work.

Thanks and see you soon,

Vicente Vasquez
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard
Oklahoma City, OK 73105
(405) 522-2802
v.vasquez@occemail.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Monday, June 13, 2016 1:19 PM
To: 'Matthew Weingarten'
Cc: Yeck, William
Subject: RE: Fairview EQ sequence

No one does, it isn't reported until the following year by April 1'st, unless its commercial than they are supposed to report bi-annually (by 1/31 & 7/31).

½ hour? Adobe so we can share screens?

From: Matthew Weingarten [mailto:mweingarten@stanford.edu]
Sent: Monday, June 13, 2016 1:11 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Yeck, William <wyeck@usgs.gov>
Subject: Re: Fairview EQ sequence

No need for 2 hours in length. Just a brief chat to compare observations.

Julie had said you were looking at wells close to the Fairview sequence in space and time. We were looking at injection wells in a more regional context, but we'd like to hear about some of your observations. Right now, we don't have access to injection well data for January or February 2016 for non-Arbuckle injection wells.

On Mon, Jun 13, 2016 at 11:02 AM, Dorsey, Nancy <Dorsey.Nancy@epa.gov> wrote:

> Okay, what did you have in mind? A general chat, or do you want me to run through the draft analysis I presented to OCC? If you want to hear the whole thing and ask questions that could run 2 hours.
>
> I would also be interested in your efforts. ☺
>
> **From:** Matthew Weingarten [mailto:mweingarten@stanford.edu]
> **Sent:** Monday, June 13, 2016 1:00 PM
> **To:** Dorsey, Nancy <Dorsey.Nancy@epa.gov>
> **Cc:** Julie Shemeta <julie@meqgeo.com>; Yeck, William <wyeck@usgs.gov>
>
> **Subject:** Re: Fairview EQ sequence
>
> Let's shoot for Thursday afternoon? 3 pm Central?

On Mon, Jun 13, 2016 at 10:46 AM, Dorsey, Nancy <Dorsey.Nancy@epa.gov> wrote:

> Hi Matt,
>
> Nice to hear from you. I am working telework the next two days, so either this afternoon, or Thursday or Friday would work for me. At the moment, I have nothing scheduled. I am on Central time, so we are what 3 hrs apart?
>
> Regards,
>
> Nancy
>
> Nancy S. Dorsey
>
> Environmental Scientist
>
> Oklahoma Class II Program Manager
>
> WQ-SG EPA Region 6
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> *Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches:* http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

From: Matthew Weingarten [mailto:mweingarten@stanford.edu]
Sent: Monday, June 13, 2016 12:14 PM
To: Julie Shemeta <julie@meqgeo.com>
Cc: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Yeck, William <wyeck@usgs.gov>
Subject: Re: Fairview EQ sequence

Hi Nancy,

Thanks for reaching out to Will Yeck and me through Julie. Is sometime this week a good time to discuss the Fairview Sequence?

Best,
Matt

On Fri, Jun 10, 2016 at 11:06 AM, Julie Shemeta <julie@meqgeo.com> wrote:

> Hi Nancy,
> I was just talking to Will Yeck at the USGS, he and Matt Weingarten (postdoc at Stanford) are working on the Fairview earthquake sequence. I suggested they should talk to you about your analysis of the nearby injection wells.
>
> Matt and Will, Nancy Dorsey is with the EPA (Dallas).
>
> I hope all can find the time to talk.
>
> Regards,
> Julie

--

Matthew Weingarten

Postdoctoral Researcher

Stanford University

SCITS: scits.stanford.edu

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Matthew Weingarten

Postdoctoral Researcher

Stanford University

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--
Matthew Weingarten
Postdoctoral Researcher
Stanford University
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--

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Monday, June 13, 2016 8:58 AM
To: 'Jim Marlatt'
Subject: RE: Historical documents of Harvey Volumes and corrections

Thanks!

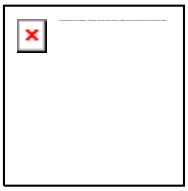
From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Monday, June 13, 2016 8:48 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: Historical documents of Harvey Volumes and corrections

Nancy,

I was going through my emails and realized that I had not sent these to you after we discussed it on the phone last fall. Just wanted you to have a copy of the exchange for your records, showing the copy paste error and corrections for the Harvey well in 2014.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Monday, June 13, 2016 8:48 AM
To: Dorsey, Nancy
Subject: Historical documents of Harvey Volumes and corrections
Attachments: removed.txt; ATT00001.htm; removed.txt; FW Harvey 1-11 SWD 7-31-2014.xlsx; No Subject

Nancy,

I was going through my emails and realized that I had not sent these to you after we discussed it on the phone last fall. Just wanted you to have a copy of the exchange for your records, showing the copy paste error and corrections for the Harvey well in 2014.

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Jim Marlatt
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Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
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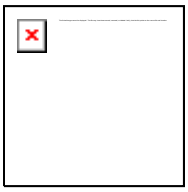
j.marlatt@occemail.com



Dorsey, Nancy

From: Dorsey, Nancy
Sent: Friday, June 10, 2016 1:20 PM
To: Julie Shemeta
Subject: RE: Fairview EQ sequence

Personally, I would take the daily over the monthly—unless they are missing days. ☺

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, June 10, 2016 1:19 PM
To: Dorsey, Nancy
Subject: RE: Fairview EQ sequence

You are welcome.
Warning, use caution with the 2015 data I sent you, it was based off the daily volume reporting.

I got the monthly volumes from OCC for 2015… and a comparison of the cumulative volumes did not match. OCC suggested the monthly data was more accurate….I'll try to send you a cleaned up file once I am happy with it.
Cheers,
Julie

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Friday, June 10, 2016 12:15 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: Fairview EQ sequence

I think Charles Lord is talking to OGS today, so things could get interesting.

I spoke with Vicente on Wednesday, he has been working on a 3D display of the Arbuckle and Basement horizons showing the injection zones, events and trying to figure out how to also show disposal volumes. He has made a good start; is working on data clean-up of the imported dataset.

I have been digging back through reservoir engineering publications trying to pullout more information from the modified Hall plots, particularly for the highly deviated/lateral wells. Not an easy task!

I don't think I have communicated with Will yet. I think I saw a u-tube of Matt's, (but I don't have a great memory for names.) Anyway, I look forward to talking with them, thank you.

Nancy

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, June 10, 2016 1:06 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: mweingarten@stanford.edu; wyeck@usgs.gov
Subject: Fairview EQ sequence

Hi Nancy,
I was just talking to Will Yeck at the USGS, he and Matt Weingarten (postdoc at Stanford) are working on the Fairview earthquake sequence. I suggested they should talk to you about your analysis of the nearby injection wells.

Matt and Will, Nancy Dorsey is with the EPA (Dallas).

I hope all can find the time to talk.

Regards,
Julie

Dorsey, Nancy

From: Julie Shemeta <julie@meqgeo.com>
Sent: Friday, June 10, 2016 1:06 PM
To: Dorsey, Nancy
Cc: mweingarten@stanford.edu; wyeck@usgs.gov
Subject: Fairview EQ sequence

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Dorsey, Nancy

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To: Dorsey, Nancy
Cc: mweingarten@stanford.edu; wyeck@usgs.gov
Subject: Fairview EQ sequence

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Matt and Will, Nancy Dorsey is with the EPA (Dallas).

I hope all can find the time to talk.

Regards,
Julie

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, June 08, 2016 9:27 AM
To: Charles Lord; Jim Marlatt
Subject: Billy SWD

I forgot to tell you to take a look at the survey tab, simplistic map of the wellbore, and seismicity. In GIS, the OGS fault crosses the wellbore…of course the scale isn't exact but the odds are the well, as your team noted, hit basement and a fault or at least fractures connecting to one.

Nancy S. Dorsey
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Oklahoma Class II Program Manager
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Dallas, TX 75202-2733
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Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, June 08, 2016 9:14 AM
To: Charles Lord
Subject: RE: Sent from Snipping Tool
Attachments: Billy_Disp_Op_to_Seis_galls_timeVar5-test.xlsx

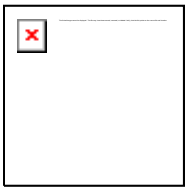
Cool, thanks!

This is what I am playing with, check out the Tandem plot! Still draft

---

From: Charles Lord [mailto:C.Lord@occemail.com]
Sent: Tuesday, June 07, 2016 4:12 PM
To: Dorsey, Nancy
Subject: Sent from Snipping Tool

Charles Lord
Senior Hydrologist
Oklahoma Corporation Commission
Post Office Box 52000
Oklahoma City, Oklahoma 73152
(405)522-2751
c.lord@occemail.com



Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, June 01, 2016 3:31 PM
To: 'Julie Shemeta'
Subject: RE: Excel file headers

Definitely a research well, I suspect they thought there was an over thrust section. Though nearly 4000' of gneiss seems more than a little extreme.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Wednesday, June 01, 2016 3:29 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: Excel file headers

What the heck!! Drilling to the moho, I guess.

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, June 01, 2016 2:28 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: Excel file headers

Originally, yes!!!

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Wednesday, June 01, 2016 3:25 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: Excel file headers

Nancy,
Is this well really 18,000 ft originally?

API	BORE	WellName	WellNum	OperatorName	County	Directiona	LONGITUDE	LATITUDE	EASTIN
3500920217	OPEN	MCNUTT	1	SMITH JR B R DISPOSAL CO	BECKHAM	VERTICAL	-99.92	35.24	1395695

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, June 01, 2016 12:09 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: Excel file headers

Hi Julie,

Actually, these are all the disposal (or injection) wells drilled into or below the Arbuckle. The 14 is my version number and has nothing to do with a year. It was updated as of April this year, I don't remember the exact date.

TD_Fm: 'Formation' or cuttings indication at Total Depth (if known)

F1002A_Inj: Initial completion date for injection (not necessarily Arbuckle)
Arb_BS: Base of the Arbuckle (Measured depth)
PBTD: plug back total depth
PB_date: date plugged back (or reported)
PB_FORM: plugging data from
Plugged back date: different data source; sometimes refers to initial plug back versus arbuckle plug back
F1003: Plugging report date

Formation tops- Granite, Reagan, Gneiss in the TD_Fm column…etc: Either cuttings or identified tops below the Arbuckle (the first or second time), noted from either OCC spreadsheets and/or completion reports or mudlogs. Essentially, from any source I could get into. ☺

For some of the earlier injection data you are still cleaning up, I can run a comparison of the totals, for the wells that match. Giving you wells that match, wells that don't or wells with no data, if that would help? I also have histories for individual wells, but I suspect that would be too much of a mess.

Feel free to ask for more clarifications or give me a call.
Nancy

214-665-2294

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Wednesday, June 01, 2016 12:50 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: Excel file headers

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Can you please send me a quick description of these column headers?
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F1002A_Inj
Arb_BS
PBTD
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Plugged back date

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Thank you,
Julie

Julie Shemeta
MEQ Geo Inc.
Microseismic Consulting and Services
Littleton, CO
Cell +1 (303) 910-0760
julie@meqgeo.com
www.meqgeo.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, June 01, 2016 3:28 PM
To: 'Julie Shemeta'
Subject: RE: Excel file headers
Attachments: OCC_OG_38J7PL9_15Q0H78.pdf

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Thank you,
Julie

Julie Shemeta
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Microseismic Consulting and Services
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Cell +1 (303) 910-0760
julie@meqgeo.com
www.meqgeo.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, June 01, 2016 1:09 PM
To: 'Julie Shemeta'
Subject: RE: Excel file headers

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julie@meqgeo.com
www.meqgeo.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Monday, May 23, 2016 12:59 PM
To: 'Vicente Vasquez'
Cc: Phillip Bailey
Subject: RE: Fairview area seismicity analysis

I sent a pdf of the power point to Charles and Jim Marlatt. So, yes, you are welcome to look at it and ask any questions you like! ☺

From: Vicente Vasquez [mailto:V.Vasquez@occemail.com]
Sent: Monday, May 23, 2016 12:28 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Phillip Bailey <P.Bailey@occemail.com>
Subject: Fairview area seismicity analysis

Nancy,

Phil and I were wondering if it was deemed fair to share the ppt of your Busy Room report?

We were interested in seeing a little closer how you put together that data – it was great!

Ppt or pdf is fine – I remember discussing that we probably shouldn't have the excel data right?

Thanks – let me know if you need anything

Vicente Vasquez
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard
Oklahoma City, OK 73105
(405) 522-2802
v.vasquez@occemail.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Friday, May 20, 2016 3:23 PM
To: Phillip Bailey (P.Bailey@occemail.com)
Subject: 2015 Arbuckle perm study

Have you seen this? http://ogs.ou.edu/docs/openfile/OF2-2015.pdf

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
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Dorsey, Nancy

From: Julie Shemeta <julie@meqgeo.com>
Sent: Thursday, May 19, 2016 5:32 PM
To: Dorsey, Nancy
Subject: RE: moment magnitude scale

Replies below.

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, May 19, 2016 2:31 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: moment magnitude scale

Thank you that makes perfect sense! (You did mention the units, so I should have double checked it.)
No worries…!

Before, I do what you don't need. Do you want a table of the well names and locations to go with the data you just sent?
I have them…thanks though.

Also, I have double checked the data I pulled, and it was only the annual volumes for the wells. Would that help? I did a test against the 2014 data and where I had information about a half a dozen were doubled or otherwise different. (Which I sent back to OCC. It may be that I do not have the most recent cleaner data.)
Ok, thanks. I would probably be better off with monthly and will continue to work on cleaning up the files as best as possible…

Cheers,
julie

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 19, 2016 2:53 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: moment magnitude scale

I think the differences are the units, one using dyne cm and one using newton meters.

Also attached is an old lecture I found online that discusses moment and magnitude (attached). Unfortunately, earthquake magnitudes are not easily measured by a standardized yardstick and each type of magnitude can yield a slightly different value for the same earthquake.

Some snippets from various papers on the topic…

The magnitude scale used in almost all microseismic studies is the moment magnitude M_W. After the seismic moment is determined, the moment magnitude can be calculated with the following equation (Kanamori, 1977; Hanks and Kanamori, 1979; M_0 in dyne-cm):

$$M_W = \frac{2}{3}\log M_0 - 10.7. \qquad (2)$$

---

earthquake properties. To resolve this issue, the moment magnitude scale was proposed by Hanks and Kanamori (1979):

$$M_W = \frac{2}{3}\log M_0 - 6.0, \qquad (3)$$

with M_0 in Nm. Estimating M_0 requires more complicated

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, May 19, 2016 1:18 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: moment magnitude scale

Hi Julie,

I was surfing to find an ml equation, and rediscovered why I skipped this before…too many options for a non-seismologist. My goal is to align with what makes sense to you, and I am lost!

So far I gave found these variations, including the Cal Tech site copy of the Hanks & Kanamori 1979 JGR, A Moment Magnitude Scale article.
http://www.gps.caltech.edu/content/kanamori/papers-1970-1979

	M	c	M what	
$\log M_0 = 17.7 + 1.2 M_L$	1.2	17.7	M_L	EQ 9 in McGarr, 1976 JGR v 81., No. 8
$\log M_0 = 15.1 + 1.7 M_L$	1.7	15.1	M_L	EQ 12 from Healy et al, 1968 in McGarr, 1976 JGR v 81., No. 8
	3/2	10.7	M_W	USGS: http://earthquake.usgs.gov/learn/topics/measure.php
	1.5	16.1	M_W	EQ 4 in Hanks & Kanamori, 1979

1.5	16.1+ +/- 0.1	M_S	EQ 5 in Hanks & Kanamori, 1979
1.5	16	M_L	EQ 6 in Hanks & Kanamori, 1979; for M_L <7

Just to confuse things even more despite the equations using c = 16.1, the lead in to the article says 10.7!

A Moment Magnitude Scale

THOMAS C. HANKS

U.S. Geological Survey, Menlo Park, California 94025

HIROO KANAMORI

Seismological Laboratory, California Institute of Technology, Pasadena, California 9

The nearly coincident forms of the relations between seismic moment M_0 and the mag
M_s, and M_w imply a moment magnitude scale $\mathbf{M} = \frac{2}{3} \log M_0 - 10.7$ which is uniformly valid
$\lesssim 7$, $5 \lesssim M_s \lesssim 7\frac{1}{2}$, and $M_w \gtrsim 7\frac{1}{2}$.

So, the above suggest the brit slide was maybe using some local special case or missed the lead '1'?

Kind of like a said to a coworker, if you have 2 geologists you frequently get 5 opinions.

Nancy

Nancy S. Dorsey
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UIC Webpages:
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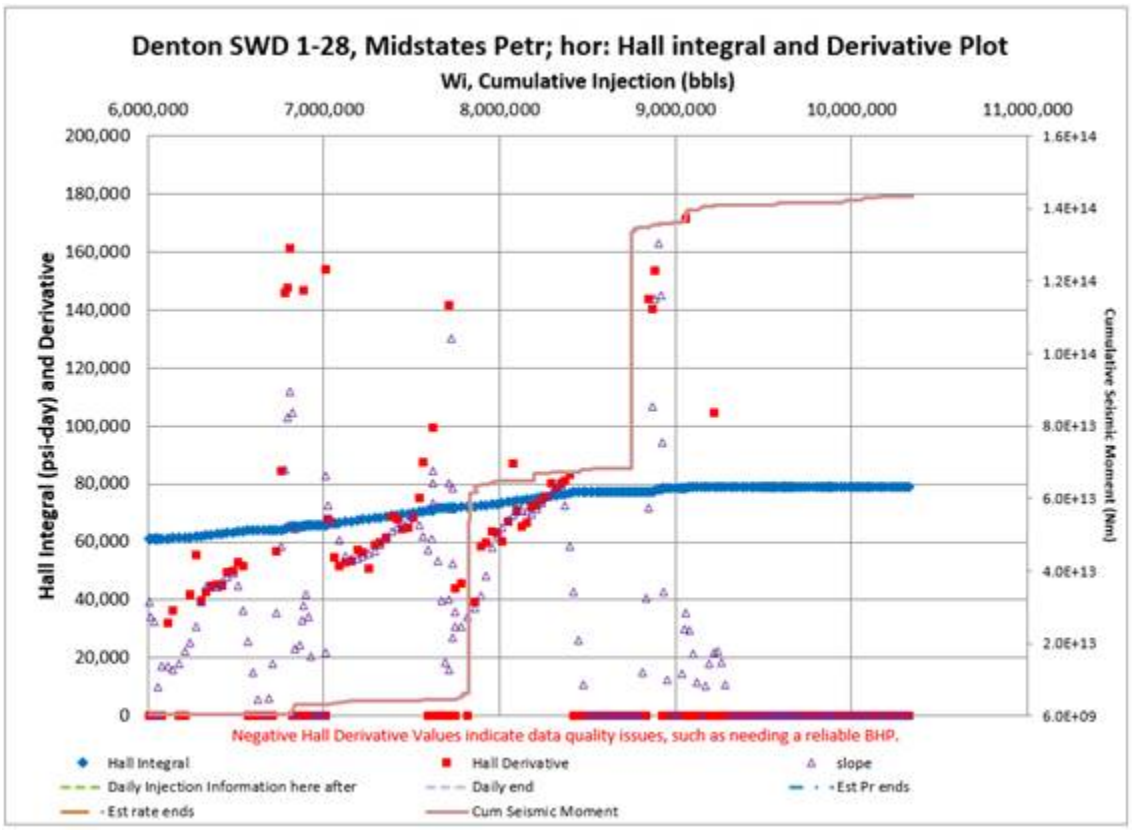
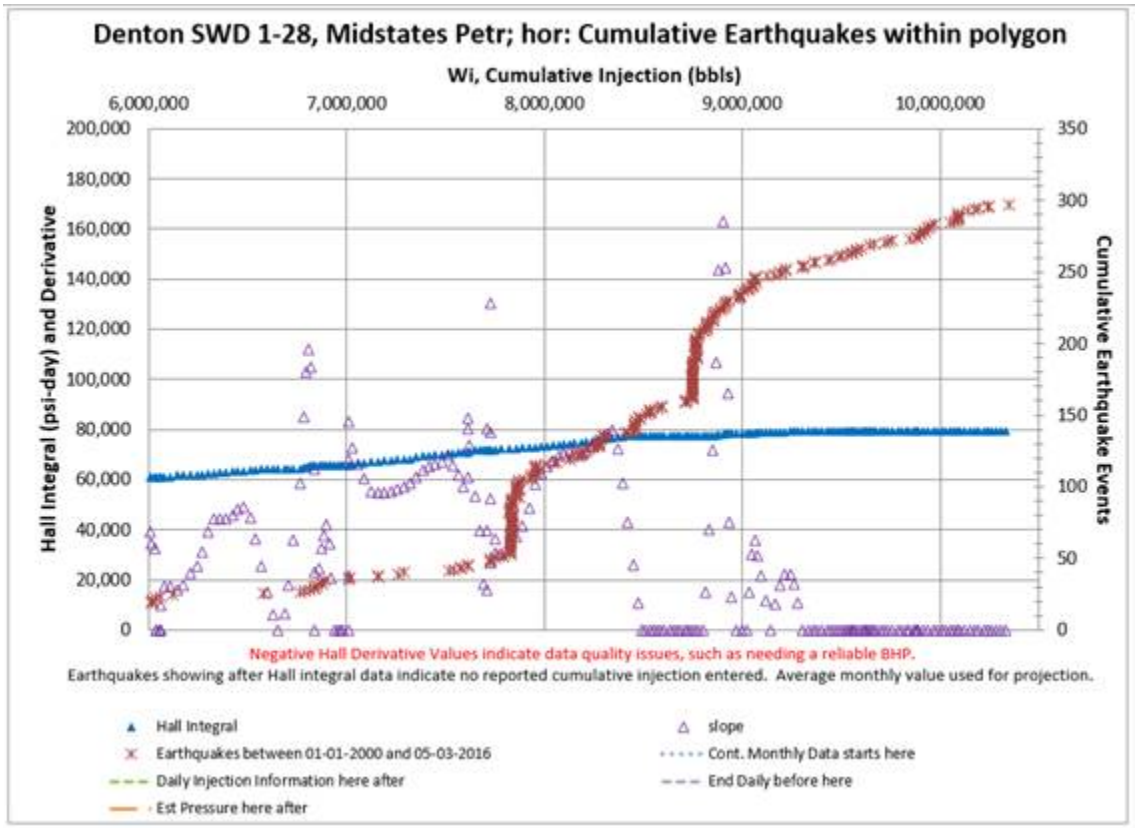
Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, May 19, 2016 3:55 PM
To: Julie Shemeta
Subject: Nm versus cumulative events

Zoomed in, perhaps not the best test case.





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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, May 19, 2016 2:26 PM
To: 'Julie Shemeta'
Subject: RE: OGS related

I think that most of the recent fault maps produced are from the data collected, but no I am anxiously/interestedly awaiting the results. I would really like to know if the preliminary results are already included in their modeling for calculated depths.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 19, 2016 2:14 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: OGS related

Thanks…the RPSEA is nearly completion…I can ask Dr. Boak about when/where results will be discussed..? Unless you know something about it…
Julie

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, May 19, 2016 1:01 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: OGS related

I had to really dig to find this again: http://www.rpsea.org/projects/12122-91/ attached fact sheet

Of interest?
http://wichita.ogs.ou.edu/documents/Holland_AGU2012.pdf FYI, Prague = Wilzetta

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, May 19, 2016 1:59 PM
To: Julie Shemeta
Subject: OGS related
Attachments: 14-002_Oklahoma Geological Survey Seismic Monitoring Program_presentation.pptx; 12122-91-PFS-4D_Integrated_Study_Using_Geology_Geophysics_Reservoir_Modeling_Rock_Mechanics-08-02-15.pdf

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, May 19, 2016 12:38 PM
To: 'Julie Shemeta'
Subject: RE: OCC Seismicity.pptx

Sounds like a plan, except I am not familiar with email file sharing.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 19, 2016 11:50 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: OCC Seismicity.pptx

Thanks. The injection files might be a bit big to email, but I can send them via an email file share.

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, May 19, 2016 10:31 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC Seismicity.pptx

Thx

I will send you the spreadsheets simplified as soon as they are completed.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 19, 2016 11:20 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: OCC Seismicity.pptx

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, May 19, 2016 11:30 AM
To: 'Julie Shemeta'
Subject: RE: OCC Seismicity.pptx
Attachments: Fairview Area Seismicity Analysis.pdf

Thx

I will send you the spreadsheets simplified as soon as they are completed.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 19, 2016 11:20 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: OCC Seismicity.pptx

Dorsey, Nancy

From: Julie Shemeta <julie@meqgeo.com>
Sent: Thursday, May 19, 2016 11:20 AM
To: Dorsey, Nancy
Subject: OCC Seismicity.pptx
Attachments: OCC Seismicity.pptx

Dorsey, Nancy

From: Phillip Bailey <P.Bailey@occemail.com>
Sent: Wednesday, May 18, 2016 4:52 PM
To: Dorsey, Nancy
Subject: RE: OCC_Project Startup Data

Thanks Nancy!

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, May 18, 2016 4:27 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

This is the original Hall plot write-up.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 10:35 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: OCC_Project Startup Data

First, I must say you're savviest excel user I've seen yet!

I think you're right on point for needing to explore (in detail) the quality of pressure data we're receiving, utilizing it as you demonstrated, and digging into stress magnitudes and fracture extension/propagation. Addressing permitted pressures (and volumes for that matter) and reviewing with those type of analyses is becoming more and more priority at this stage. The team has made great strides working with the volume data to date and getting better data management practices in place. It will take more time to get the entire UIC database up to par (data quality and ability to use the data actually). For example, we're pushing for LAS data be submitted in conjunction with the normal well log filings. Whether that could be a rule or not…many of us believe it should. New age, new technology, we need to keep up with the times.

I'm interested in the Hall plots and the calculations used. Specifically, what assumptions/constants were used. Conceptually, what is realistic in terms of fracture extension and propagation given a certain stress regime (SS), with the magnitude and azimuths of Shmax, Sv, and Shmin? Then in vertical vs. deviated wells? Your analysis is the first I've seen that starts to address those questions. Especially the pressure gradient calculations. Are those the fracture gradients…? Hard to say, right without more data.

If you have some time soon, I'd like to discuss these things in more detail with you.

Side note: I will be working on a thesis proposal for my master's coursework at OSU. My aim is further Arbuckle characterization (regionally) related to porosity trends (zonations) within it and how diagensis has contributed to such. My ultimate goal is to link geomechanical data (maybe approach Zoback…) to how rock mechanic properties may change or vary from zone-to-zone (if of course we can identify zones based on such).

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From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, May 18, 2016 10:06 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Thanks Phil!

Any thoughts on my presentation yesterday?

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 8:09 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: FW: OCC_Project Startup Data

Nancy,

See below.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 17, 2016 4:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Of course. Tell her I plan to call her and let her know my contact info
Cell 303 910 0760
julie@meggeo.com

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 17, 2016 3:01 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I wanted to share the draft video with Nancy Dorsey that you provided of the WOK area because it is a unique visual of the dataset(s). Would you mind?

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
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p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 13, 2016 2:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

I should get the older injection data from you.

Here is a draft video, showing cumulative injection and time injection varying with seismicity in NW region….WOK and SRA areas.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 1:12 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: FW: OCC_Project Startup Data

Here's another way of addressing that question (start of injection) or observations of injection trends over time.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Friday, May 13, 2016 2:10 PM
To: 'Julie Shemeta'
Cc: Charles Lord; Bob Griffith
Subject: FW: OCC_Project Startup Data

Yes, we're in the process of compiling this data for the wells in the AOI (~750 wells). And it's both **spud date** and **start of injection** that we're getting together. It may be another weeks or so before we have it ready and organized. See what we can do…(along with **KB**, **TD,** and **injection intervals**).

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 1:27 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, do we have a spud data or start of injection data for the disposal wells? I have injection data loaded for everything you gave me, but I am curious which wells are "new" and which are the older injectors…
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 7:41 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

No, we do to IHS. We've been trying for the last month to activate our subscriptions though.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 8:35 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Does the OCC have a DrillingInfo account by chance?
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 2:22 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

There are two files, "TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls", that have the point data.

Frac databases…not sure. I would have to check. I haven't come across any yet.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Thursday, May 12, 2016 3:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

You can also just give me the data points and I can let Transform make a horizon….

Thanks. I am just loading injection data now.
By chance, do you have a frac database with well locations/frac times/frac volumes by chance? Just curious to see how much activity is associated with fracs.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 1:27 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I've included my attempts of converting the Top of Basement (feet subsea) surface to a file type that can easily be brought into Transform into "G&G_Shapefiles". I'm kind of at a lost of creating an ASCII XYZ. However, I tried (2) other options…

- Hz_bsmt_spline.asc and .prj → exported as ASCII
- Hz_bsmtsplm31 → exported as GRID

Note: Spline interpolation used. I digitzed a shapefile for where Cambrian-Ordovician outcrops exist to stop interpolations within those areas (used surface geology and gravity to highlight uplift areas and appropriate age rock units). There is also an area in SW OK where we had no data (but the Arbuckle likely exists in subsurface). Below is top of basement surface w/ associated estimated outcrop and no data areas. Data points for shown and included for reference ("TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls").

Let me know if this works. If so, I'll create a top of arbuckle surface as well.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Tuesday, May 10, 2016 4:45 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 10, 2016 11:05 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

O sorry. I put the new 2016 daily data in your folder ("Current_DailyVol_Export").

Ok, awesome.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Tuesday, May 10, 2016 12:02 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Hi Phillip,
Let me know when you get the new injection file done. I will start on the older data to check for any issues.

I have a call in with a contact at IHS to see what 3D Surveys they know about, I will let you know what I find out.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Monday, May 09, 2016 4:35 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Hi Julie,

I reviewed the 29 wells you flagged on Friday. I found most of the duplicates were indeed from the update. Others had more spurious data that indicated the operators updated their data before/after each update (in some cases substantial changes…). I want to run a few more traps first thing tomorrow with this 2016 dataset and then I will update the file in your folder ("Current_DailyVol_Export").

Also, I digitized a shapefile for data I dug up from TGS and SEI showing 3D seismic coverage throughout the state. In G&G Shapefiles→ "Seis_3D_All_OK". We'll update as we get more data in.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 1:54 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

No worries, this is a huge data set.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 12:32 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Wonderful…I will comb through this data on Monday. I have to run out for the remainder of the day; however, I can say for certain any duplicate values or inconsistent daily data from mid-March onward are because of an update we did. Because of the data is initially on separate spreadsheets/tabs, we had to script a macro to compile all then update an existing table in Access. A lot of places where dup's can be created or errors in updating can occur. We will resolve on Monday. Sorry for the hang up.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 11:32 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
I am now loading the injection data and the spreadsheet for Jan-April has a few issues- see attached spreadsheet. Some of the edits were easy, a well might have a duplicate volume for the same date. However, the wells in red are troublesome, as they have two entries on the same date with different volumes and I am not sure which volume to use- can you take a quick look --or send this to whoever works on the injection volume excel file?

My notes are a bit cryptic on this sheet, it has API and well name and number and then a some information about the problem I found in the data. The entries in RED are the wells that I am not sure what do about.

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 8:22 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Exactly. Sorry about that. Pressure in psi also.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 9:18 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, the units in the injection spreadsheet- it is barrels of fluid?

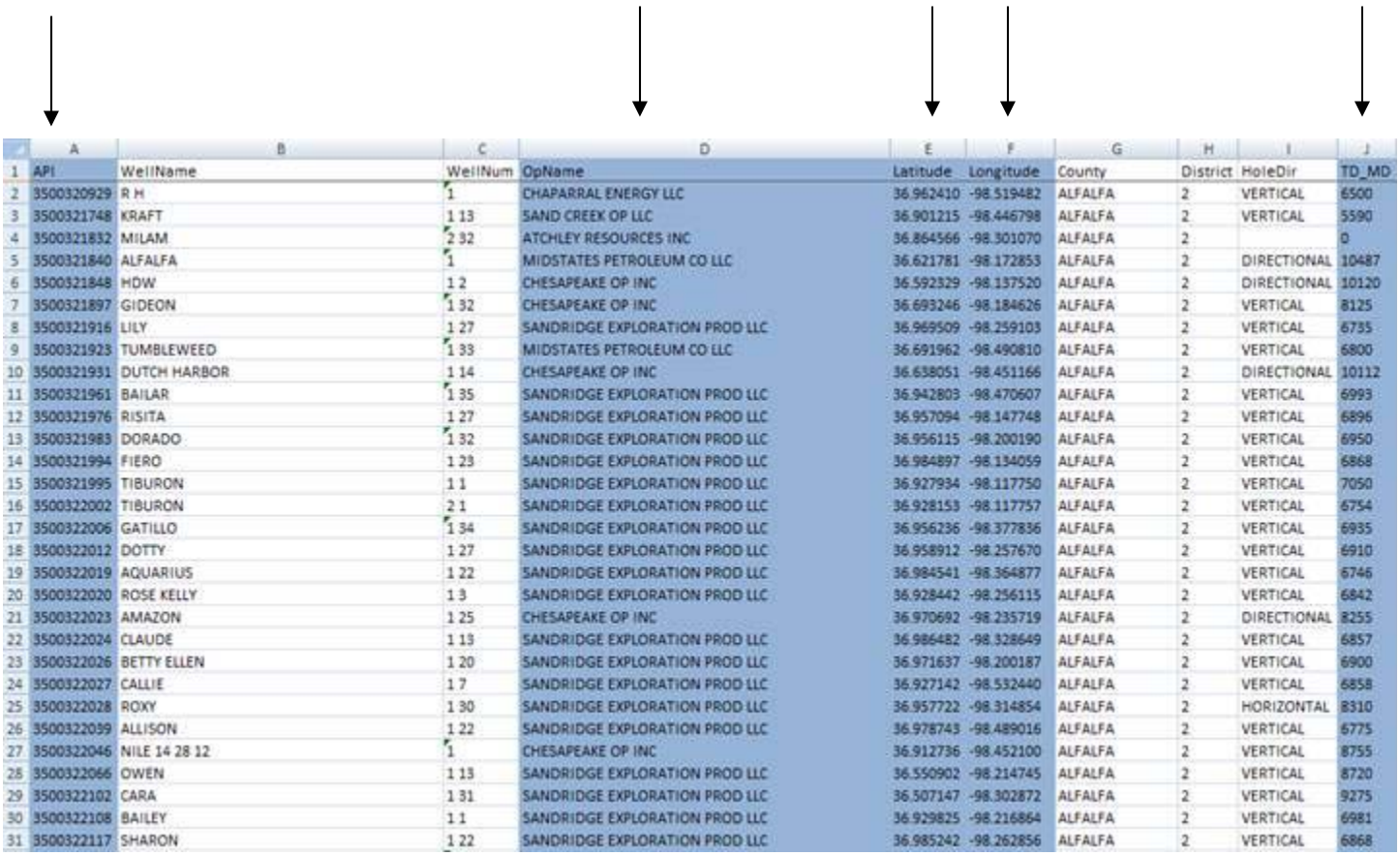
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 6:26 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: FW: OCC_Project Startup Data

Good morning,

I forgot we have an initial subset of this data. In the "UIC_InjWells" folder there is a .xls file called "Wells_OK_CamOrdo". This is data from IHS that we have compiled that includes the data you're looking for. As we work through updating our team database, we will populate the missing data in the days to come.

Ex.



	A	B	C	D	E	F	G	H	I	J
1	API	WellName	WellNum	OpName	Latitude	Longitude	County	District	HoleDir	TD_MD
2	3500320929	R H	1	CHAPARRAL ENERGY LLC	36.962410	-98.519482	ALFALFA	2	VERTICAL	6500
3	3500321748	KRAFT	1 13	SAND CREEK OP LLC	36.901215	-98.446798	ALFALFA	2	VERTICAL	5590
4	3500321832	MILAM	2 32	ATCHLEY RESOURCES INC	36.864566	-98.301070	ALFALFA	2		0
5	3500321840	ALFALFA	1	MIDSTATES PETROLEUM CO LLC	36.621781	-98.172853	ALFALFA	2	DIRECTIONAL	10487
6	3500321848	HDW	1 2	CHESAPEAKE OP INC	36.592329	-98.137520	ALFALFA	2	DIRECTIONAL	10120
7	3500321897	GIDEON	1 32	CHESAPEAKE OP INC	36.693246	-98.184626	ALFALFA	2	VERTICAL	8125
8	3500321916	LILY	1 27	SANDRIDGE EXPLORATION PROD LLC	36.969509	-98.259103	ALFALFA	2	VERTICAL	6735
9	3500321923	TUMBLEWEED	1 33	MIDSTATES PETROLEUM CO LLC	36.691962	-98.490810	ALFALFA	2	VERTICAL	6800
10	3500321931	DUTCH HARBOR	1 14	CHESAPEAKE OP INC	36.638051	-98.451166	ALFALFA	2	DIRECTIONAL	10112
11	3500321961	BAILAR	1 35	SANDRIDGE EXPLORATION PROD LLC	36.942803	-98.470607	ALFALFA	2	VERTICAL	6993
12	3500321976	RISITA	1 27	SANDRIDGE EXPLORATION PROD LLC	36.957094	-98.147748	ALFALFA	2	VERTICAL	6896
13	3500321983	DORADO	1 32	SANDRIDGE EXPLORATION PROD LLC	36.956115	-98.200190	ALFALFA	2	VERTICAL	6950
14	3500321994	FIERO	1 23	SANDRIDGE EXPLORATION PROD LLC	36.984897	-98.134059	ALFALFA	2	VERTICAL	6868
15	3500321995	TIBURON	1 1	SANDRIDGE EXPLORATION PROD LLC	36.927934	-98.117750	ALFALFA	2	VERTICAL	7050
16	3500322002	TIBURON	2 1	SANDRIDGE EXPLORATION PROD LLC	36.928153	-98.117757	ALFALFA	2	VERTICAL	6754
17	3500322006	GATILLO	1 34	SANDRIDGE EXPLORATION PROD LLC	36.956236	-98.377836	ALFALFA	2	VERTICAL	6935
18	3500322012	DOTTY	1 27	SANDRIDGE EXPLORATION PROD LLC	36.958912	-98.257670	ALFALFA	2	VERTICAL	6910
19	3500322019	AQUARIUS	1 22	SANDRIDGE EXPLORATION PROD LLC	36.984541	-98.364877	ALFALFA	2	VERTICAL	6746
20	3500322020	ROSE KELLY	1 3	SANDRIDGE EXPLORATION PROD LLC	36.928442	-98.256115	ALFALFA	2	VERTICAL	6842
21	3500322023	AMAZON	1 25	CHESAPEAKE OP INC	36.970692	-98.235719	ALFALFA	2	DIRECTIONAL	8255
22	3500322024	CLAUDE	1 13	SANDRIDGE EXPLORATION PROD LLC	36.986482	-98.328649	ALFALFA	2	VERTICAL	6857
23	3500322026	BETTY ELLEN	1 20	SANDRIDGE EXPLORATION PROD LLC	36.971637	-98.200187	ALFALFA	2	VERTICAL	6900
24	3500322027	CALLIE	1 7	SANDRIDGE EXPLORATION PROD LLC	36.927142	-98.532440	ALFALFA	2	VERTICAL	6858
25	3500322028	ROXY	1 30	SANDRIDGE EXPLORATION PROD LLC	36.957722	-98.314854	ALFALFA	2	HORIZONTAL	8310
26	3500322039	ALLISON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.978743	-98.489016	ALFALFA	2	VERTICAL	6775
27	3500322046	NILE 14 28 12	1	CHESAPEAKE OP INC	36.912736	-98.452100	ALFALFA	2	VERTICAL	8755
28	3500322066	OWEN	1 13	SANDRIDGE EXPLORATION PROD LLC	36.550902	-98.214745	ALFALFA	2	VERTICAL	8720
29	3500322102	CARA	1 31	SANDRIDGE EXPLORATION PROD LLC	36.507147	-98.302872	ALFALFA	2	VERTICAL	9275
30	3500322108	BAILEY	1 1	SANDRIDGE EXPLORATION PROD LLC	36.929825	-98.216864	ALFALFA	2	VERTICAL	6981
31	3500322117	SHARON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.985242	-98.262856	ALFALFA	2	VERTICAL	6868

Regards,

Phillip Bailey
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Oklahoma City, OK 73105
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p.bailey@occemail.com

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:08 PM
To: 'Julie Shemeta'
Subject: FW: OCC_Project Startup Data

For KB's, depending on the completeness of what we have, I'm pretty sure we can extract a GL for wells using the DEM.

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:06 PM
To: 'Julie Shemeta'
Subject: RE: OCC_Project Startup Data

Yes to your first question, but…it may take a little digging/time to work with the database folks for KB and TD. KB has not really been captured (tabled) to my knowledge. I'll see what I have first thing tomorrow. Might have IHS data for now…

No, deviation surveys are not readily available especially in a tabled format (all pdf's of the survey reports). We have a couple here and there but for AOI HZ disposal wells, nothing substantial. Would it be good to have survey reports for what we have even if a few, or best to have a whole dataset?

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 05, 2016 4:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Is it possible to get a well list of the injection wells with API, well name, X, Y, operator, KB and TD?
Are deviation surveys available for the wells?
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 05, 2016 2:21 PM
To: julie@meqgeo.com
Cc: Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
Subject: OCC_Project Startup Data

Julie,

We've created a folder found via the path below.

ftp://ftp.occeweb.com/gismaps → Swarm Volume Data → 00_Induced Seismicity Project → JShemeta

In there are multiple folders. Below is a brief breakdown of what each contains.

- **DailyVolumes –** Daily volumes and pressures for all wells in the area of interest (n>700 wells) in *.xls* format.
  - **Current_2016** – Only 2016 to date (up to 3/31/2016)
  - **Historical_2012 thru 2015 -** ~2012 through 2015 (completeness of dataset is best 2014-2015)

- **AOI_AOR_Shapefiles –** Outlines of the area of interest and areas of reduction (NAD83 UTM Zone 14 projection)

- **Culture_Shapefiles –** Culture layers of state, county, waterbodies, etc. (NAD83 UTM Zone 14 projection)

- **DEM_30m –** Mosaic of 30m res DEM for state (NAD83 UTM Zone 14 projection)

- **G&G_Shapefiles –** Geology & Geophysical datasets (kind of thin now) including faults (OGS-2015), and surface geology (NAD83 UTM Zone 14 projection). We will send over a top of basement structure map (compiled from literature and logs) and Arbuckle isopach map (top calls from logs and completion reports) soon. We're in the process of updating these maps based on the additional well data we've received over the last several months and converting to grids that you can load into Transform. ASCII grids work??

- **UIC_InjWells -** UIC well spots (shapefiles) with borehole traces for those that are DIR/HZ. Separated by those TD'd in Cambrian-Ordovician age formations, All, and those in AOI.

- **Also…there is a UIC_Volumes_ALL folder in 00_Induced Seismicity Project**
    - **Compilation Data pulls –** "Raw" monthly volume/pressure (yearly filings-1012A) data in .xls format.
    - **Data byYear –** Cleaned up, broken out by year with locations in .xls format.
    - **UIC Geodatabase –** Shapefile by year and month for wells with coordinates (NAD83 UTM Zone 14 projection). All formations/ all UIC wells.

Regards,

Phillip Bailey
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2101 N. Lincoln Boulevard, Room 214
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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 18, 2016 4:27 PM
To: 'Phillip Bailey'
Subject: RE: OCC_Project Startup Data
Attachments: How to analyze waterflood injecton well performance_by Hall_World Oil_Oct 1963.pdf

This is the original Hall plot write-up.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 10:35 AM
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I'm interested in the Hall plots and the calculations used. Specifically, what assumptions/constants were used. Conceptually, what is realistic in terms of fracture extension and propagation given a certain stress regime (SS), with the magnitude and azimuths of Shmax, Sv, and Shmin? Then in vertical vs. deviated wells? Your analysis is the first I've seen that starts to address those questions. Especially the pressure gradient calculations. Are those the fracture gradients…? Hard to say, right without more data.

If you have some time soon, I'd like to discuss these things in more detail with you.

Side note: I will be working on a thesis proposal for my master's coursework at OSU. My aim is further Arbuckle characterization (regionally) related to porosity trends (zonations) within it and how diagensis has contributed to such. My ultimate goal is to link geomechanical data (maybe approach Zoback…) to how rock mechanic properties may change or vary from zone-to-zone (if of course we can identify zones based on such).

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To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

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Sent: Wednesday, May 18, 2016 8:09 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: FW: OCC_Project Startup Data

Nancy,

See below.

Regards,

Phillip Bailey
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From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Tuesday, May 17, 2016 4:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Of course. Tell her I plan to call her and let her know my contact info
Cell 303 910 0760
julie@meqgeo.com

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 17, 2016 3:01 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I wanted to share the draft video with Nancy Dorsey that you provided of the WOK area because it is a unique visual of the dataset(s). Would you mind?

Regards,

Phillip Bailey

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From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 2:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

I should get the older injection data from you.

Here is a draft video, showing cumulative injection and time injection varying with seismicity in NW region….WOK and SRA areas.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 1:12 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: FW: OCC_Project Startup Data

Here's another way of addressing that question (start of injection) or observations of injection trends over time.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Friday, May 13, 2016 2:10 PM
To: 'Julie Shemeta'
Cc: Charles Lord; Bob Griffith
Subject: FW: OCC_Project Startup Data

Yes, we're in the process of compiling this data for the wells in the AOI (~750 wells). And it's both **spud date** and **start of injection** that we're getting together. It may be another weeks or so before we have it ready and organized. See what we can do…(along with **KB**, **TD,** and **injection intervals**).

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 1:27 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, do we have a spud data or start of injection data for the disposal wells? I have injection data loaded for everything you gave me, but I am curious which wells are "new" and which are the older injectors…
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 7:41 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

No, we do to IHS. We've been trying for the last month to activate our subscriptions though.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 8:35 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Does the OCC have a DrillingInfo account by chance?
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 2:22 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

There are two files, "TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls", that have the point data.

Frac databases…not sure. I would have to check. I haven't come across any yet.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Thursday, May 12, 2016 3:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

You can also just give me the data points and I can let Transform make a horizon….

Thanks. I am just loading injection data now.
By chance, do you have a frac database with well locations/frac times/frac volumes by chance? Just curious to see how much activity is associated with fracs.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 1:27 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I've included my attempts of converting the Top of Basement (feet subsea) surface to a file type that can easily be brought into Transform into "G&G_Shapefiles". I'm kind of at a lost of creating an ASCII XYZ. However, I tried (2) other options…

- Hz_bsmt_spline.asc and .prj → exported as ASCII
- Hz_bsmtsplm31 → exported as GRID

Note: Spline interpolation used. I digitzed a shapefile for where Cambrian-Ordovician outcrops exist to stop interpolations within those areas (used surface geology and gravity to highlight uplift areas and appropriate age rock units). There is also an area in SW OK where we had no data (but the Arbuckle likely exists in subsurface). Below is top of basement surface w/ associated estimated outcrop and no data areas. Data points for shown and included for reference ("TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls").

Let me know if this works. If so, I'll create a top of arbuckle surface as well.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 10, 2016 4:45 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 10, 2016 11:05 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

O sorry. I put the new 2016 daily data in your folder ("Current_DailyVol_Export").

Ok, awesome.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 10, 2016 12:02 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Hi Phillip,
Let me know when you get the new injection file done. I will start on the older data to check for any issues.

I have a call in with a contact at IHS to see what 3D Surveys they know about, I will let you know what I find out.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Monday, May 09, 2016 4:35 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Hi Julie,

I reviewed the 29 wells you flagged on Friday. I found most of the duplicates were indeed from the update. Others had more spurious data that indicated the operators updated their data before/after each update (in some cases substantial changes…). I want to run a few more traps first thing tomorrow with this 2016 dataset and then I will update the file in your folder ("Current_DailyVol_Export").

Also, I digitized a shapefile for data I dug up from TGS and SEI showing 3D seismic coverage throughout the state. In G&G Shapefiles→ "Seis_3D_All_OK". We'll update as we get more data in.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 1:54 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

No worries, this is a huge data set.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 12:32 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Wonderful…I will comb through this data on Monday. I have to run out for the remainder of the day; however, I can say for certain any duplicate values or inconsistent daily data from mid-March onward are because of an update we did. Because of the data is initially on separate spreadsheets/tabs, we had to script a macro to compile all then update an existing table in Access. A lot of places where dup's can be created or errors in updating can occur. We will resolve on Monday. Sorry for the hang up.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 11:32 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
I am now loading the injection data and the spreadsheet for Jan-April has a few issues- see attached spreadsheet. Some of the edits were easy, a well might have a duplicate volume for the same date. However, the wells in red are troublesome, as they have two entries on the same date with different volumes and I am not sure which volume to use- can you take a quick look --or send this to whoever works on the injection volume excel file?

My notes are a bit cryptic on this sheet, it has API and well name and number and then a some information about the problem I found in the data. The entries in RED are the wells that I am not sure what do about.

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 8:22 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Exactly. Sorry about that. Pressure in psi also.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 9:18 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, the units in the injection spreadsheet- it is barrels of fluid?

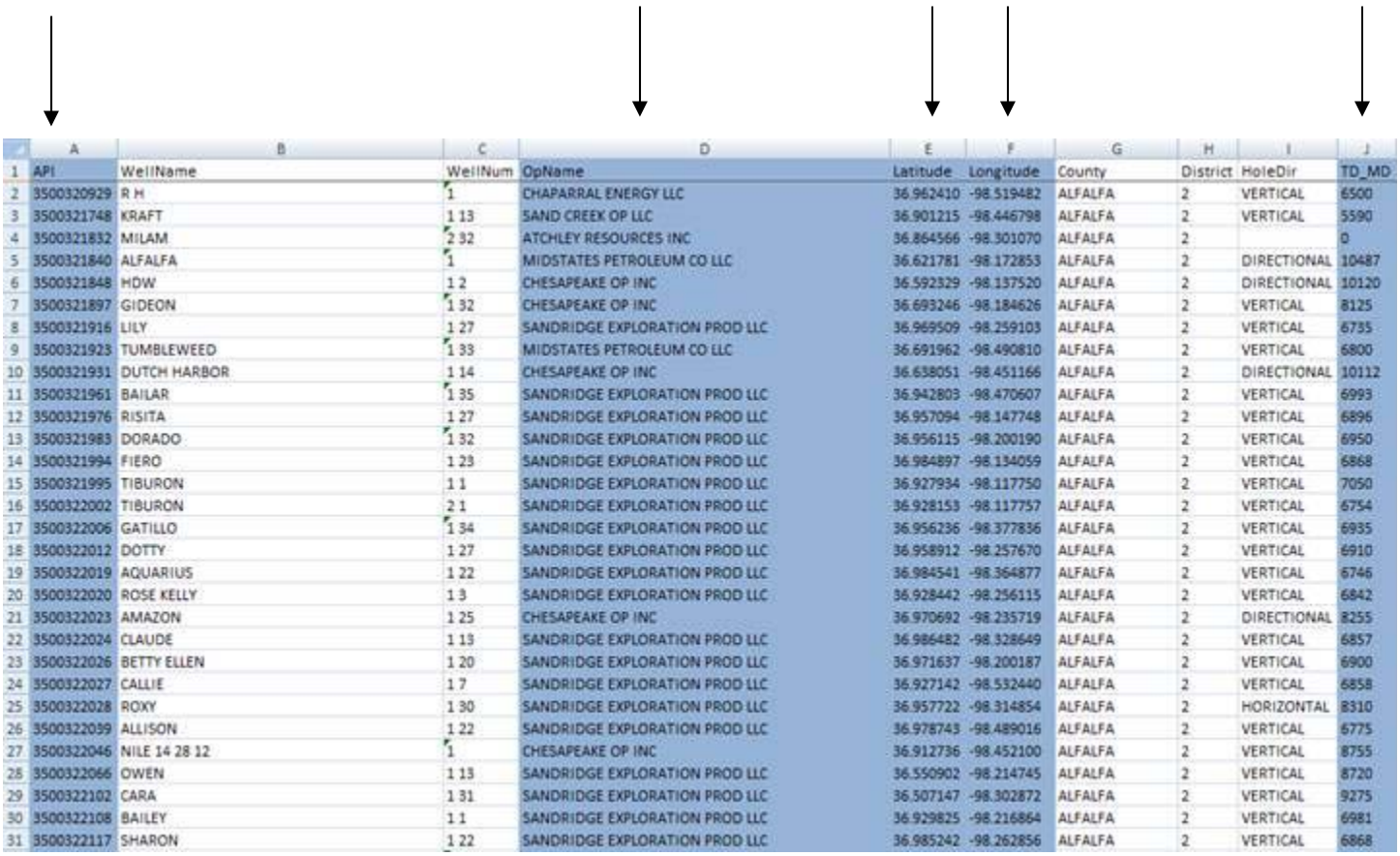
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 6:26 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: FW: OCC_Project Startup Data

Good morning,

I forgot we have an initial subset of this data. In the "UIC_InjWells" folder there is a .xls file called "Wells_OK_CamOrdo". This is data from IHS that we have compiled that includes the data you're looking for. As we work through updating our team database, we will populate the missing data in the days to come.

Ex.



	A	B	C	D	E	F	G	H	I	J
1	API	WellName	WellNum	OpName	Latitude	Longitude	County	District	HoleDir	TD_MD
2	3500320929	R H	1	CHAPARRAL ENERGY LLC	36.962410	-98.519482	ALFALFA	2	VERTICAL	6500
3	3500321748	KRAFT	1 13	SAND CREEK OP LLC	36.901215	-98.446798	ALFALFA	2	VERTICAL	5590
4	3500321832	MILAM	2 32	ATCHLEY RESOURCES INC	36.864566	-98.301070	ALFALFA	2		0
5	3500321840	ALFALFA	1	MIDSTATES PETROLEUM CO LLC	36.621781	-98.172853	ALFALFA	2	DIRECTIONAL	10487
6	3500321848	HDW	1 2	CHESAPEAKE OP INC	36.592329	-98.137520	ALFALFA	2	DIRECTIONAL	10120
7	3500321897	GIDEON	1 32	CHESAPEAKE OP INC	36.693246	-98.184626	ALFALFA	2	VERTICAL	8125
8	3500321916	LILY	1 27	SANDRIDGE EXPLORATION PROD LLC	36.969509	-98.259103	ALFALFA	2	VERTICAL	6735
9	3500321923	TUMBLEWEED	1 33	MIDSTATES PETROLEUM CO LLC	36.691962	-98.490810	ALFALFA	2	VERTICAL	6800
10	3500321931	DUTCH HARBOR	1 14	CHESAPEAKE OP INC	36.638051	-98.451166	ALFALFA	2	DIRECTIONAL	10112
11	3500321961	BAILAR	1 35	SANDRIDGE EXPLORATION PROD LLC	36.942803	-98.470607	ALFALFA	2	VERTICAL	6993
12	3500321976	RISITA	1 27	SANDRIDGE EXPLORATION PROD LLC	36.957094	-98.147748	ALFALFA	2	VERTICAL	6896
13	3500321983	DORADO	1 32	SANDRIDGE EXPLORATION PROD LLC	36.956115	-98.200190	ALFALFA	2	VERTICAL	6950
14	3500321994	FIERO	1 23	SANDRIDGE EXPLORATION PROD LLC	36.984897	-98.134059	ALFALFA	2	VERTICAL	6868
15	3500321995	TIBURON	1 1	SANDRIDGE EXPLORATION PROD LLC	36.927934	-98.117750	ALFALFA	2	VERTICAL	7050
16	3500322002	TIBURON	2 1	SANDRIDGE EXPLORATION PROD LLC	36.928153	-98.117757	ALFALFA	2	VERTICAL	6754
17	3500322006	GATILLO	1 34	SANDRIDGE EXPLORATION PROD LLC	36.956236	-98.377836	ALFALFA	2	VERTICAL	6935
18	3500322012	DOTTY	1 27	SANDRIDGE EXPLORATION PROD LLC	36.958912	-98.257670	ALFALFA	2	VERTICAL	6910
19	3500322019	AQUARIUS	1 22	SANDRIDGE EXPLORATION PROD LLC	36.984541	-98.364877	ALFALFA	2	VERTICAL	6746
20	3500322020	ROSE KELLY	1 3	SANDRIDGE EXPLORATION PROD LLC	36.928442	-98.256115	ALFALFA	2	VERTICAL	6842
21	3500322023	AMAZON	1 25	CHESAPEAKE OP INC	36.970692	-98.235719	ALFALFA	2	DIRECTIONAL	8255
22	3500322024	CLAUDE	1 13	SANDRIDGE EXPLORATION PROD LLC	36.986482	-98.328649	ALFALFA	2	VERTICAL	6857
23	3500322026	BETTY ELLEN	1 20	SANDRIDGE EXPLORATION PROD LLC	36.971637	-98.200187	ALFALFA	2	VERTICAL	6900
24	3500322027	CALLIE	1 7	SANDRIDGE EXPLORATION PROD LLC	36.927142	-98.532440	ALFALFA	2	VERTICAL	6858
25	3500322028	ROXY	1 30	SANDRIDGE EXPLORATION PROD LLC	36.957722	-98.314854	ALFALFA	2	HORIZONTAL	8310
26	3500322039	ALLISON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.978743	-98.489016	ALFALFA	2	VERTICAL	6775
27	3500322046	NILE 14 28 12	1	CHESAPEAKE OP INC	36.912736	-98.452100	ALFALFA	2	VERTICAL	8755
28	3500322066	OWEN	1 13	SANDRIDGE EXPLORATION PROD LLC	36.550902	-98.214745	ALFALFA	2	VERTICAL	8720
29	3500322102	CARA	1 31	SANDRIDGE EXPLORATION PROD LLC	36.507147	-98.302872	ALFALFA	2	VERTICAL	9275
30	3500322108	BAILEY	1 1	SANDRIDGE EXPLORATION PROD LLC	36.929825	-98.216864	ALFALFA	2	VERTICAL	6981
31	3500322117	SHARON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.985242	-98.262856	ALFALFA	2	VERTICAL	6868

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:08 PM
To: 'Julie Shemeta'
Subject: FW: OCC_Project Startup Data

For KB's, depending on the completeness of what we have, I'm pretty sure we can extract a GL for wells using the DEM.

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:06 PM
To: 'Julie Shemeta'
Subject: RE: OCC_Project Startup Data

Yes to your first question, but…it may take a little digging/time to work with the database folks for KB and TD. KB has not really been captured (tabled) to my knowledge. I'll see what I have first thing tomorrow. Might have IHS data for now…

No, deviation surveys are not readily available especially in a tabled format (all pdf's of the survey reports). We have a couple here and there but for AOI HZ disposal wells, nothing substantial. Would it be good to have survey reports for what we have even if a few, or best to have a whole dataset?

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 05, 2016 4:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Is it possible to get a well list of the injection wells with API, well name, X, Y, operator, KB and TD?
Are deviation surveys available for the wells?
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 05, 2016 2:21 PM
To: julie@meqgeo.com
Cc: Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
Subject: OCC_Project Startup Data

Julie,

We've created a folder found via the path below.

ftp://ftp.occeweb.com/gismaps → Swarm Volume Data → 00_Induced Seismicity Project → JShemeta

In there are multiple folders. Below is a brief breakdown of what each contains.

- **DailyVolumes –** Daily volumes and pressures for all wells in the area of interest (n>700 wells) in *.xls* format.
  - **Current_2016** – Only 2016 to date (up to 3/31/2016)
  - **Historical_2012 thru 2015 -** ~2012 through 2015 (completeness of dataset is best 2014-2015)

- **AOI_AOR_Shapefiles –** Outlines of the area of interest and areas of reduction (NAD83 UTM Zone 14 projection)

- **Culture_Shapefiles –** Culture layers of state, county, waterbodies, etc. (NAD83 UTM Zone 14 projection)

- **DEM_30m –** Mosaic of 30m res DEM for state (NAD83 UTM Zone 14 projection)

- **G&G_Shapefiles –** Geology & Geophysical datasets (kind of thin now) including faults (OGS-2015), and surface geology (NAD83 UTM Zone 14 projection). We will send over a top of basement structure map (compiled from literature and logs) and Arbuckle isopach map (top calls from logs and completion reports) soon. We're in the process of updating these maps based on the additional well data we've received over the last several months and converting to grids that you can load into Transform. ASCII grids work??

- **UIC_InjWells -** UIC well spots (shapefiles) with borehole traces for those that are DIR/HZ. Separated by those TD'd in Cambrian-Ordovician age formations, All, and those in AOI.

- **Also…there is a UIC_Volumes_ALL folder in 00_Induced Seismicity Project**
    - **Compilation Data pulls –** "Raw" monthly volume/pressure (yearly filings-1012A) data in .xls format.
    - **Data byYear –** Cleaned up, broken out by year with locations in .xls format.
    - **UIC Geodatabase –** Shapefile by year and month for wells with coordinates (NAD83 UTM Zone 14 projection). All formations/ all UIC wells.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 18, 2016 4:22 PM
To: Julie Shemeta
Subject: OCC wells
Attachments: UIC12_DEV_PTS.xlsx; qry_UIC_WELLS14_Arb+.xlsx; Arbuckle.xlsx

Are these any help?

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 18, 2016 11:02 AM
To: 'Phillip Bailey'
Subject: RE: OCC_Project Startup Data

You might find our NTW report, see the last link in my signature line interesting—particularly the engineering appendix.

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

---

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 10:35 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: OCC_Project Startup Data

First, I must say you're savviest excel user I've seen yet!

I think you're right on point for needing to explore (in detail) the quality of pressure data we're receiving, utilizing it as you demonstrated, and digging into stress magnitudes and fracture extension/propagation. Addressing permitted pressures (and volumes for that matter) and reviewing with those type of analyses is becoming more and more priority at this stage. The team has made great strides working with the volume data to date and getting better data management practices in place. It will take more time to get the entire UIC database up to par (data quality and ability to use the data actually). For example, we're pushing for LAS data be submitted in conjunction with the normal well log filings. Whether that could be a rule or not…many of us believe it should. New age, new technology, we need to keep up with the times.

I'm interested in the Hall plots and the calculations used. Specifically, what assumptions/constants were used. Conceptually, what is realistic in terms of fracture extension and propagation given a certain stress regime (SS), with the magnitude and azimuths of Shmax, Sv, and Shmin? Then in vertical vs. deviated wells? Your analysis is the first I've seen that starts to address those questions. Especially the pressure gradient calculations. Are those the fracture gradients…? Hard to say, right without more data.

If you have some time soon, I'd like to discuss these things in more detail with you.

Side note: I will be working on a thesis proposal for my master's coursework at OSU. My aim is further Arbuckle characterization (regionally) related to porosity trends (zonations) within it and how diagensis has contributed to such. My ultimate goal is to link geomechanical data (maybe approach Zoback…) to how rock mechanic properties may change or vary from zone-to-zone (if of course we can identify zones based on such).

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, May 18, 2016 10:06 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Thanks Phil!

Any thoughts on my presentation yesterday?

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 8:09 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: FW: OCC_Project Startup Data

Nancy,

See below.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 17, 2016 4:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Of course. Tell her I plan to call her and let her know my contact info
Cell 303 910 0760
julie@meggeo.com

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 17, 2016 3:01 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I wanted to share the draft video with Nancy Dorsey that you provided of the WOK area because it is a unique visual of the dataset(s). Would you mind?

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
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Oklahoma City, OK 73105
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From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 13, 2016 2:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

I should get the older injection data from you.

Here is a draft video, showing cumulative injection and time injection varying with seismicity in NW region….WOK and SRA areas.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
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Here's another way of addressing that question (start of injection) or observations of injection trends over time.

Regards,

Phillip Bailey
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From: Phillip Bailey
Sent: Friday, May 13, 2016 2:10 PM
To: 'Julie Shemeta'
Cc: Charles Lord; Bob Griffith
Subject: FW: OCC_Project Startup Data

Yes, we're in the process of compiling this data for the wells in the AOI (~750 wells). And it's both **spud date** and **start of injection** that we're getting together. It may be another weeks or so before we have it ready and organized. See what we can do…(along with **KB**, **TD,** and **injection intervals**).

Regards,

Phillip Bailey
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From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 1:27 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, do we have a spud data or start of injection data for the disposal wells? I have injection data loaded for everything you gave me, but I am curious which wells are "new" and which are the older injectors…
Thanks,
Julie

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Sent: Friday, May 13, 2016 7:41 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

No, we do to IHS. We've been trying for the last month to activate our subscriptions though.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 8:35 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Does the OCC have a DrillingInfo account by chance?
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 2:22 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

There are two files, "TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls", that have the point data.

Frac databases…not sure. I would have to check. I haven't come across any yet.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Thursday, May 12, 2016 3:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

You can also just give me the data points and I can let Transform make a horizon….

Thanks. I am just loading injection data now.
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Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 1:27 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I've included my attempts of converting the Top of Basement (feet subsea) surface to a file type that can easily be brought into Transform into "G&G_Shapefiles". I'm kind of at a lost of creating an ASCII XYZ. However, I tried (2) other options…

- Hz_bsmt_spline.asc and .prj → exported as ASCII
- Hz_bsmtsplm31 → exported as GRID

Note: Spline interpolation used. I digitzed a shapefile for where Cambrian-Ordovician outcrops exist to stop interpolations within those areas (used surface geology and gravity to highlight uplift areas and appropriate age rock units). There is also an area in SW OK where we had no data (but the Arbuckle likely exists in subsurface). Below is top of basement surface w/ associated estimated outcrop and no data areas. Data points for shown and included for reference ("TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls").

Let me know if this works. If so, I'll create a top of arbuckle surface as well.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 10, 2016 4:45 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 10, 2016 11:05 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

O sorry. I put the new 2016 daily data in your folder ("Current_DailyVol_Export").

Ok, awesome.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 10, 2016 12:02 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Hi Phillip,
Let me know when you get the new injection file done. I will start on the older data to check for any issues.

I have a call in with a contact at IHS to see what 3D Surveys they know about, I will let you know what I find out.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Monday, May 09, 2016 4:35 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Hi Julie,

I reviewed the 29 wells you flagged on Friday. I found most of the duplicates were indeed from the update. Others had more spurious data that indicated the operators updated their data before/after each update (in some cases substantial changes…). I want to run a few more traps first thing tomorrow with this 2016 dataset and then I will update the file in your folder ("Current_DailyVol_Export").

Also, I digitized a shapefile for data I dug up from TGS and SEI showing 3D seismic coverage throughout the state. In G&G Shapefiles→ "Seis_3D_All_OK". We'll update as we get more data in.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 1:54 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

No worries, this is a huge data set.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 12:32 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Wonderful…I will comb through this data on Monday. I have to run out for the remainder of the day; however, I can say for certain any duplicate values or inconsistent daily data from mid-March onward are because of an update we did. Because of the data is initially on separate spreadsheets/tabs, we had to script a macro to compile all then update an existing table in Access. A lot of places where dup's can be created or errors in updating can occur. We will resolve on Monday. Sorry for the hang up.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 11:32 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
I am now loading the injection data and the spreadsheet for Jan-April has a few issues- see attached spreadsheet. Some of the edits were easy, a well might have a duplicate volume for the same date. However, the wells in red are troublesome, as they have two entries on the same date with different volumes and I am not sure which volume to use- can you take a quick look --or send this to whoever works on the injection volume excel file?

My notes are a bit cryptic on this sheet, it has API and well name and number and then a some information about the problem I found in the data. The entries in RED are the wells that I am not sure what do about.

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 8:22 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Exactly. Sorry about that. Pressure in psi also.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 9:18 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, the units in the injection spreadsheet- it is barrels of fluid?

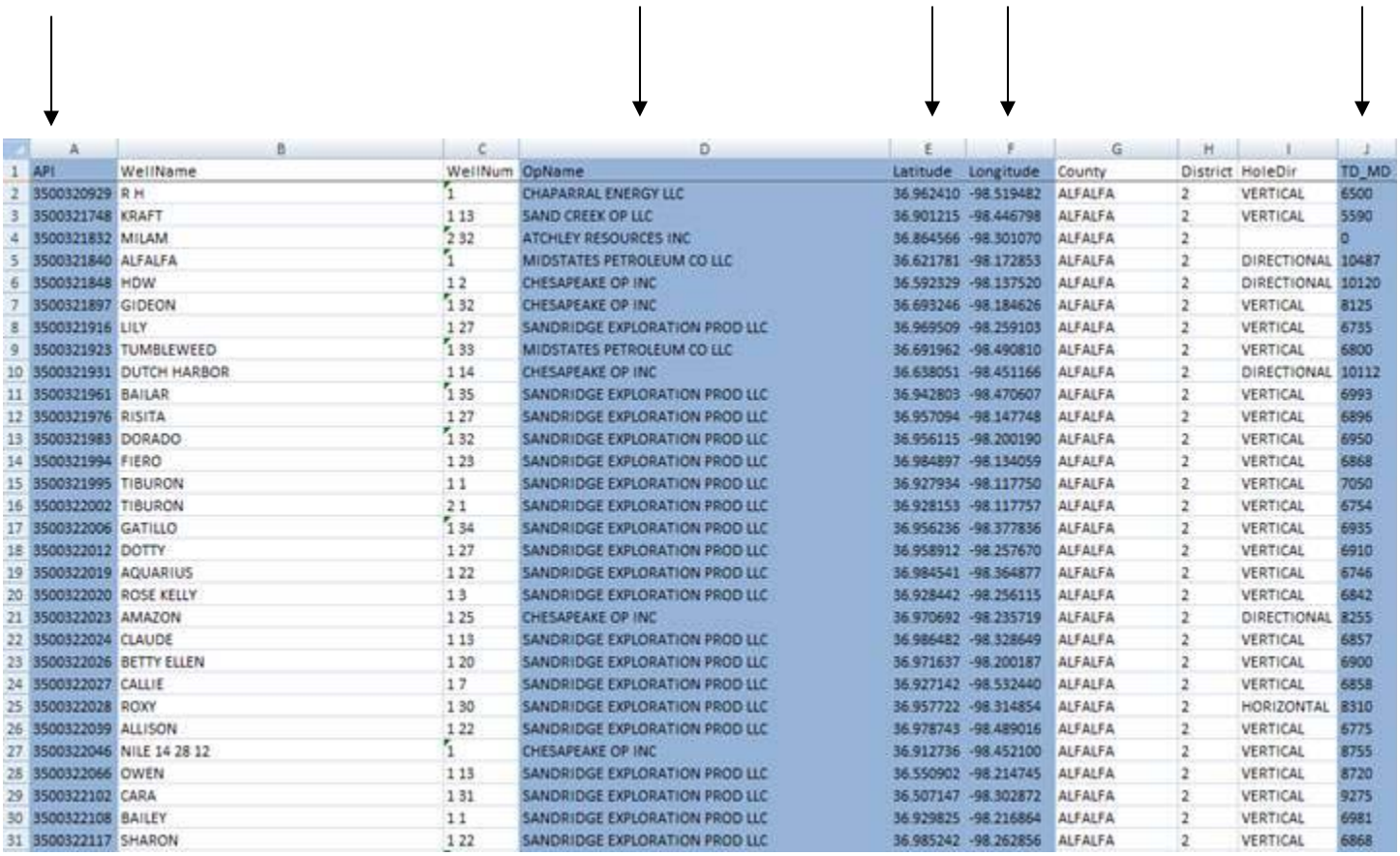
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 6:26 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: FW: OCC_Project Startup Data

Good morning,

I forgot we have an initial subset of this data. In the "UIC_InjWells" folder there is a .xls file called "Wells_OK_CamOrdo". This is data from IHS that we have compiled that includes the data you're looking for. As we work through updating our team database, we will populate the missing data in the days to come.

Ex.



	A	B	C	D	E	F	G	H	I	J
1	API	WellName	WellNum	OpName	Latitude	Longitude	County	District	HoleDir	TD_MD
2	3500320929	R H	1	CHAPARRAL ENERGY LLC	36.962410	-98.519482	ALFALFA	2	VERTICAL	6500
3	3500321748	KRAFT	1 13	SAND CREEK OP LLC	36.901215	-98.446798	ALFALFA	2	VERTICAL	5590
4	3500321832	MILAM	2 32	ATCHLEY RESOURCES INC	36.864566	-98.301070	ALFALFA	2		0
5	3500321840	ALFALFA	1	MIDSTATES PETROLEUM CO LLC	36.621781	-98.172853	ALFALFA	2	DIRECTIONAL	10487
6	3500321848	HDW	1 2	CHESAPEAKE OP INC	36.592329	-98.137520	ALFALFA	2	DIRECTIONAL	10120
7	3500321897	GIDEON	1 32	CHESAPEAKE OP INC	36.693246	-98.184626	ALFALFA	2	VERTICAL	8125
8	3500321916	LILY	1 27	SANDRIDGE EXPLORATION PROD LLC	36.969509	-98.259103	ALFALFA	2	VERTICAL	6735
9	3500321923	TUMBLEWEED	1 33	MIDSTATES PETROLEUM CO LLC	36.691962	-98.490810	ALFALFA	2	VERTICAL	6800
10	3500321931	DUTCH HARBOR	1 14	CHESAPEAKE OP INC	36.638051	-98.451166	ALFALFA	2	DIRECTIONAL	10112
11	3500321961	BAILAR	1 35	SANDRIDGE EXPLORATION PROD LLC	36.942803	-98.470607	ALFALFA	2	VERTICAL	6993
12	3500321976	RISITA	1 27	SANDRIDGE EXPLORATION PROD LLC	36.957094	-98.147748	ALFALFA	2	VERTICAL	6896
13	3500321983	DORADO	1 32	SANDRIDGE EXPLORATION PROD LLC	36.956115	-98.200190	ALFALFA	2	VERTICAL	6950
14	3500321994	FIERO	1 23	SANDRIDGE EXPLORATION PROD LLC	36.984897	-98.134059	ALFALFA	2	VERTICAL	6868
15	3500321995	TIBURON	1 1	SANDRIDGE EXPLORATION PROD LLC	36.927934	-98.117750	ALFALFA	2	VERTICAL	7050
16	3500322002	TIBURON	2 1	SANDRIDGE EXPLORATION PROD LLC	36.928153	-98.117757	ALFALFA	2	VERTICAL	6754
17	3500322006	GATILLO	1 34	SANDRIDGE EXPLORATION PROD LLC	36.956236	-98.377836	ALFALFA	2	VERTICAL	6935
18	3500322012	DOTTY	1 27	SANDRIDGE EXPLORATION PROD LLC	36.958912	-98.257670	ALFALFA	2	VERTICAL	6910
19	3500322019	AQUARIUS	1 22	SANDRIDGE EXPLORATION PROD LLC	36.984541	-98.364877	ALFALFA	2	VERTICAL	6746
20	3500322020	ROSE KELLY	1 3	SANDRIDGE EXPLORATION PROD LLC	36.928442	-98.256115	ALFALFA	2	VERTICAL	6842
21	3500322023	AMAZON	1 25	CHESAPEAKE OP INC	36.970692	-98.235719	ALFALFA	2	DIRECTIONAL	8255
22	3500322024	CLAUDE	1 13	SANDRIDGE EXPLORATION PROD LLC	36.986482	-98.328649	ALFALFA	2	VERTICAL	6857
23	3500322026	BETTY ELLEN	1 20	SANDRIDGE EXPLORATION PROD LLC	36.971637	-98.200187	ALFALFA	2	VERTICAL	6900
24	3500322027	CALLIE	1 7	SANDRIDGE EXPLORATION PROD LLC	36.927142	-98.532440	ALFALFA	2	VERTICAL	6858
25	3500322028	ROXY	1 30	SANDRIDGE EXPLORATION PROD LLC	36.957722	-98.314854	ALFALFA	2	HORIZONTAL	8310
26	3500322039	ALLISON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.978743	-98.489016	ALFALFA	2	VERTICAL	6775
27	3500322046	NILE 14 28 12	1	CHESAPEAKE OP INC	36.912736	-98.452100	ALFALFA	2	VERTICAL	8755
28	3500322066	OWEN	1 13	SANDRIDGE EXPLORATION PROD LLC	36.550902	-98.214745	ALFALFA	2	VERTICAL	8720
29	3500322102	CARA	1 31	SANDRIDGE EXPLORATION PROD LLC	36.507147	-98.302872	ALFALFA	2	VERTICAL	9275
30	3500322108	BAILEY	1 1	SANDRIDGE EXPLORATION PROD LLC	36.929825	-98.216864	ALFALFA	2	VERTICAL	6981
31	3500322117	SHARON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.985242	-98.262856	ALFALFA	2	VERTICAL	6868

Regards,

Phillip Bailey
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Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:08 PM
To: 'Julie Shemeta'
Subject: FW: OCC_Project Startup Data

For KB's, depending on the completeness of what we have, I'm pretty sure we can extract a GL for wells using the DEM.

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:06 PM
To: 'Julie Shemeta'
Subject: RE: OCC_Project Startup Data

Yes to your first question, but…it may take a little digging/time to work with the database folks for KB and TD. KB has not really been captured (tabled) to my knowledge. I'll see what I have first thing tomorrow. Might have IHS data for now…

No, deviation surveys are not readily available especially in a tabled format (all pdf's of the survey reports). We have a couple here and there but for AOI HZ disposal wells, nothing substantial. Would it be good to have survey reports for what we have even if a few, or best to have a whole dataset?

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 05, 2016 4:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Is it possible to get a well list of the injection wells with API, well name, X, Y, operator, KB and TD?
Are deviation surveys available for the wells?
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 05, 2016 2:21 PM
To: julie@meqgeo.com
Cc: Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
Subject: OCC_Project Startup Data

Julie,

We've created a folder found via the path below.

ftp://ftp.occeweb.com/gismaps → Swarm Volume Data → 00_Induced Seismicity Project → JShemeta

In there are multiple folders. Below is a brief breakdown of what each contains.

- **DailyVolumes –** Daily volumes and pressures for all wells in the area of interest (n>700 wells) in *.xls* format.
  - **Current_2016** – Only 2016 to date (up to 3/31/2016)
  - **Historical_2012 thru 2015 -** ~2012 through 2015 (completeness of dataset is best 2014-2015)

- **AOI_AOR_Shapefiles –** Outlines of the area of interest and areas of reduction (NAD83 UTM Zone 14 projection)

- **Culture_Shapefiles –** Culture layers of state, county, waterbodies, etc. (NAD83 UTM Zone 14 projection)

- **DEM_30m –** Mosaic of 30m res DEM for state (NAD83 UTM Zone 14 projection)

- **G&G_Shapefiles –** Geology & Geophysical datasets (kind of thin now) including faults (OGS-2015), and surface geology (NAD83 UTM Zone 14 projection). We will send over a top of basement structure map (compiled from literature and logs) and Arbuckle isopach map (top calls from logs and completion reports) soon. We're in the process of updating these maps based on the additional well data we've received over the last several months and converting to grids that you can load into Transform. ASCII grids work??

- **UIC_InjWells -** UIC well spots (shapefiles) with borehole traces for those that are DIR/HZ. Separated by those TD'd in Cambrian-Ordovician age formations, All, and those in AOI.

- **Also…there is a UIC_Volumes_ALL folder in 00_Induced Seismicity Project**
    - **Compilation Data pulls –** "Raw" monthly volume/pressure (yearly filings-1012A) data in .xls format.
    - **Data byYear –** Cleaned up, broken out by year with locations in .xls format.
    - **UIC Geodatabase –** Shapefile by year and month for wells with coordinates (NAD83 UTM Zone 14 projection). All formations/ all UIC wells.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 18, 2016 10:51 AM
To: 'Phillip Bailey'
Subject: RE: OCC_Project Startup Data

Ahh, thank you! Right now I have discovered that Excel says that a cell calculated to "" is greater than 3100!!!?! Not confidence inspiring.

For the Hall and modified Hall plots, these are key references:

Key Technical References

Hall, H.N., 1963, How to analyze waterflood injection well performance: World Oil, October 1963, p 128-130.

Jarrell, P.M. and M.H. Stein; 1991, Maximizing Injection Rates in Wells Recently Converted to Injection Using Hearn and Hall Plots; SPE 21724-MS.

Izgec, B., and C. S. Kabir, 2009, Real-time performance analysis of water-injection wells: SPE Reservoir Evaluation & Engineering, v. 12, no. 1, p. 116-123, SPE 109876-PA

Aschehoug, M. and C. S. Kabir, 2013, Real-Time Evaluation of Carbon Dioxide Production and Sequestration in a Gas Field; SPE 16314p-PA-P.

In the oil patch unless the engineers are designing an HF or planning a directional well, I don't think they work so much about the stress fields. At least not the reservoir and operational engineers. They rely on step rate tests to evaluate the fracture gradient in the specific zone. Unfortunately, these can be misrun through no fault of the operator. Example, the pump pressure based on available equipment such as a tank truck for the water supply can't stop down low enough to get below frac pressure. Also they usually only get 3 or 4 points, so if the wrong step is picked they can't get a plot.

The mind set for micro-seismic varies widely in terminology and usage between the geophysicists and the petroleum engineers such as Norm Warpinski. He was with pinnacle and has a lot of publications out there on directional drilling, HR, etc. It is not my field.

Interesting topic for a thesis. You might want to refine it a bit from the stand point of the wide variation of what is called Arbuckle across the state. At least in some of the publications I have collected, I am not sure it is always quite the same. I know some of the mudlogs show sand symbols in the Arbuckle, which seems odd to me, but then I am not an expert on the formation by any means. (understatement) ☺

I am working from home today.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 10:35 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: OCC_Project Startup Data

First, I must say you're savviest excel user I've seen yet!

I think you're right on point for needing to explore (in detail) the quality of pressure data we're receiving, utilizing it as you demonstrated, and digging into stress magnitudes and fracture extension/propagation. Addressing permitted pressures (and volumes for that matter) and reviewing with those type of analyses is becoming more and more priority at this stage. The team has made great strides working with the volume data to date and getting better data management practices in place. It will take more time to get the entire UIC database up to par (data quality and ability to use the data actually). For example, we're pushing for LAS data be submitted in conjunction with the normal well log filings. Whether that could be a rule or not…many of us believe it should. New age, new technology, we need to keep up with the times.

I'm interested in the Hall plots and the calculations used. Specifically, what assumptions/constants were used. Conceptually, what is realistic in terms of fracture extension and propagation given a certain stress regime (SS), with the magnitude and azimuths of Shmax, Sv, and Shmin? Then in vertical vs. deviated wells? Your analysis is the first I've seen that starts to address those questions. Especially the pressure gradient calculations. Are those the fracture gradients…? Hard to say, right without more data.

If you have some time soon, I'd like to discuss these things in more detail with you.

Side note: I will be working on a thesis proposal for my master's coursework at OSU. My aim is further Arbuckle characterization (regionally) related to porosity trends (zonations) within it and how diagensis has contributed to such. My ultimate goal is to link geomechanical data (maybe approach Zoback…) to how rock mechanic properties may change or vary from zone-to-zone (if of course we can identify zones based on such).

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, May 18, 2016 10:06 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Thanks Phil!

Any thoughts on my presentation yesterday?

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 8:09 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: FW: OCC_Project Startup Data

Nancy,

See below.

Regards,

Phillip Bailey

Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 17, 2016 4:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Of course. Tell her I plan to call her and let her know my contact info
Cell 303 910 0760
julie@meggeo.com

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 17, 2016 3:01 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I wanted to share the draft video with Nancy Dorsey that you provided of the WOK area because it is a unique visual of the dataset(s). Would you mind?

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 2:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

I should get the older injection data from you.

Here is a draft video, showing cumulative injection and time injection varying with seismicity in NW region….WOK and SRA areas.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 1:12 PM

To: Julie Shemeta <julie@meggeo.com>
Subject: FW: OCC_Project Startup Data

Here's another way of addressing that question (start of injection) or observations of injection trends over time.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Friday, May 13, 2016 2:10 PM
To: 'Julie Shemeta'
Cc: Charles Lord; Bob Griffith
Subject: FW: OCC_Project Startup Data

Yes, we're in the process of compiling this data for the wells in the AOI (~750 wells). And it's both **spud date** and **start of injection** that we're getting together. It may be another weeks or so before we have it ready and organized. See what we can do…(along with **KB**, **TD,** and **injection intervals**).

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 13, 2016 1:27 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, do we have a spud data or start of injection data for the disposal wells? I have injection data loaded for everything you gave me, but I am curious which wells are "new" and which are the older injectors…
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 7:41 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

No, we do to IHS. We've been trying for the last month to activate our subscriptions though.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 13, 2016 8:35 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Does the OCC have a DrillingInfo account by chance?
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 2:22 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

There are two files, "TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls", that have the point data.

Frac databases…not sure. I would have to check. I haven't come across any yet.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Thursday, May 12, 2016 3:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

You can also just give me the data points and I can let Transform make a horizon….

Thanks. I am just loading injection data now.
By chance, do you have a frac database with well locations/frac times/frac volumes by chance? Just curious to see how much activity is associated with fracs.
Julie

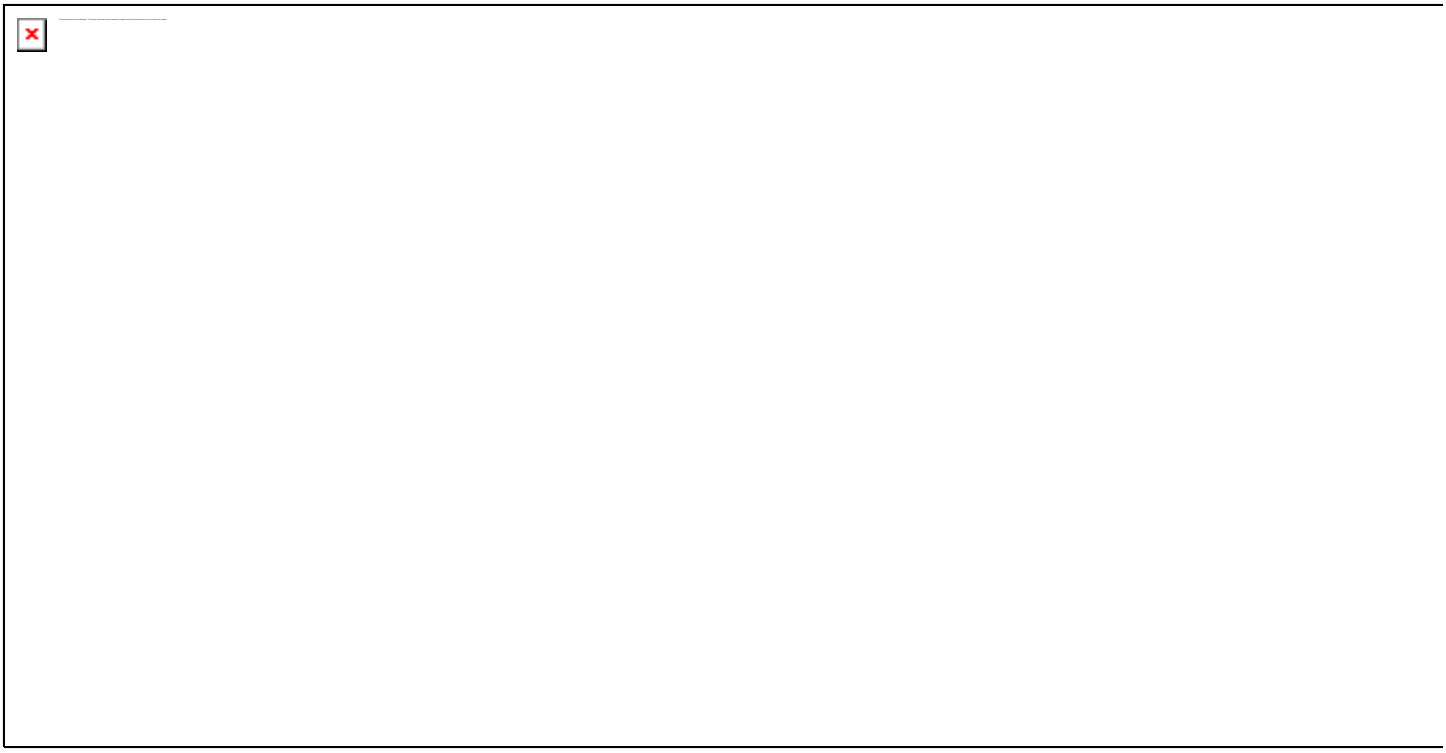
From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 1:27 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I've included my attempts of converting the Top of Basement (feet subsea) surface to a file type that can easily be brought into Transform into "G&G_Shapefiles". I'm kind of at a lost of creating an ASCII XYZ. However, I tried (2) other options…

- Hz_bsmt_spline.asc and .prj → exported as ASCII
- Hz_bsmtsplm31 → exported as GRID

Note: Spline interpolation used. I digitzed a shapefile for where Cambrian-Ordovician outcrops exist to stop interpolations within those areas (used surface geology and gravity to highlight uplift areas and appropriate age rock units). There is also an area in SW OK where we had no data (but the Arbuckle likely exists in subsurface). Below is top of basement surface w/ associated estimated outcrop and no data areas. Data points for shown and included for reference ("TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls").



Let me know if this works. If so, I'll create a top of arbuckle surface as well.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Tuesday, May 10, 2016 4:45 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

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From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 10, 2016 11:05 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

O sorry. I put the new 2016 daily data in your folder ("Current_DailyVol_Export").

Ok, awesome.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Tuesday, May 10, 2016 12:02 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Hi Phillip,
Let me know when you get the new injection file done. I will start on the older data to check for any issues.

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Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Monday, May 09, 2016 4:35 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Hi Julie,

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Regards,

Phillip Bailey
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p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 06, 2016 1:54 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

No worries, this is a huge data set.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 12:32 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Wonderful…I will comb through this data on Monday. I have to run out for the remainder of the day; however, I can say for certain any duplicate values or inconsistent daily data from mid-March onward are because of an update we did. Because of the data is initially on separate spreadsheets/tabs, we had to script a macro to compile all then update an existing table in Access. A lot of places where dup's can be created or errors in updating can occur. We will resolve on Monday. Sorry for the hang up.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 06, 2016 11:32 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,

I am now loading the injection data and the spreadsheet for Jan-April has a few issues- see attached spreadsheet. Some of the edits were easy, a well might have a duplicate volume for the same date. However, the wells in red are troublesome, as they have two entries on the same date with different volumes and I am not sure which volume to use- can you take a quick look --or send this to whoever works on the injection volume excel file?

My notes are a bit cryptic on this sheet, it has API and well name and number and then a some information about the problem I found in the data. The entries in RED are the wells that I am not sure what do about.

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 8:22 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Exactly. Sorry about that. Pressure in psi also.

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 06, 2016 9:18 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, the units in the injection spreadsheet- it is barrels of fluid?
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 06, 2016 6:26 AM
To: Julie Shemeta <julie@meqgeo.com>
Subject: FW: OCC_Project Startup Data

Good morning,

I forgot we have an initial subset of this data. In the "UIC_InjWells" folder there is a .xls file called "Wells_OK_CamOrdo". This is data from IHS that we have compiled that includes the data you're looking for. As we work through updating our team database, we will populate the missing data in the days to come.

Ex.

	A	B	C	D	E	F	G	H	I	J
1	API	WellName	WellNum	OpName	Latitude	Longitude	County	District	HoleDir	TD_MD
2	3500320929	R H	1	CHAPARRAL ENERGY LLC	36.962410	-98.519482	ALFALFA	2	VERTICAL	6500
3	3500321748	KRAFT	1 13	SAND CREEK OP LLC	36.901215	-98.446798	ALFALFA	2	VERTICAL	5590
4	3500321832	MILAM	2 32	ATCHLEY RESOURCES INC	36.864566	-98.301070	ALFALFA	2		0
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25	3500322028	ROXY	1 30	SANDRIDGE EXPLORATION PROD LLC	36.957722	-98.314854	ALFALFA	2	HORIZONTAL	8310
26	3500322059	ALLISON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.978743	-98.489016	ALFALFA	2	VERTICAL	6775
27	3500322046	NILE 14 28 12	1	CHESAPEAKE OP INC	36.912736	-98.452100	ALFALFA	2	VERTICAL	8755
28	3500322066	OWEN	1 13	SANDRIDGE EXPLORATION PROD LLC	36.550902	-98.214745	ALFALFA	2	VERTICAL	8720
29	3500322102	CARA	1 31	SANDRIDGE EXPLORATION PROD LLC	36.507147	-98.302872	ALFALFA	2	VERTICAL	9275
30	3500322108	BAILEY	1 1	SANDRIDGE EXPLORATION PROD LLC	36.929825	-98.216864	ALFALFA	2	VERTICAL	6981
31	3500322117	SHARON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.985242	-98.262856	ALFALFA	2	VERTICAL	6868

Regards,

Phillip Bailey
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Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:08 PM
To: 'Julie Shemeta'
Subject: FW: OCC_Project Startup Data

For KB's, depending on the completeness of what we have, I'm pretty sure we can extract a GL for wells using the DEM.

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:06 PM
To: 'Julie Shemeta'
Subject: RE: OCC_Project Startup Data

Yes to your first question, but…it may take a little digging/time to work with the database folks for KB and TD. KB has not really been captured (tabled) to my knowledge. I'll see what I have first thing tomorrow. Might have IHS data for now…

No, deviation surveys are not readily available especially in a tabled format (all pdf's of the survey reports). We have a couple here and there but for AOI HZ disposal wells, nothing substantial. Would it be good to have survey reports for what we have even if a few, or best to have a whole dataset?

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 05, 2016 4:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Is it possible to get a well list of the injection wells with API, well name, X, Y, operator, KB and TD?
Are deviation surveys available for the wells?
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 05, 2016 2:21 PM
To: julie@meqgeo.com
Cc: Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
Subject: OCC_Project Startup Data

Julie,

We've created a folder found via the path below.

ftp://ftp.occeweb.com/gismaps → Swarm Volume Data → 00_Induced Seismicity Project → JShemeta

In there are multiple folders. Below is a brief breakdown of what each contains.

- **DailyVolumes –** Daily volumes and pressures for all wells in the area of interest (n>700 wells) in *.xls* format.
  - **Current_2016** – Only 2016 to date (up to 3/31/2016)
  - **Historical_2012 thru 2015 -** ~2012 through 2015 (completeness of dataset is best 2014-2015)

- **AOI_AOR_Shapefiles –** Outlines of the area of interest and areas of reduction (NAD83 UTM Zone 14 projection)

- **Culture_Shapefiles –** Culture layers of state, county, waterbodies, etc. (NAD83 UTM Zone 14 projection)

- **DEM_30m –** Mosaic of 30m res DEM for state (NAD83 UTM Zone 14 projection)

- **G&G_Shapefiles –** Geology & Geophysical datasets (kind of thin now) including faults (OGS-2015), and surface geology (NAD83 UTM Zone 14 projection). We will send over a top of basement structure map (compiled from literature and logs) and Arbuckle isopach map (top calls from logs and completion reports) soon. We're in the process of updating these maps based on the additional well data we've received over the last several months and converting to grids that you can load into Transform. ASCII grids work??

- **UIC_InjWells** - UIC well spots (shapefiles) with borehole traces for those that are DIR/HZ. Separated by those TD'd in Cambrian-Ordovician age formations, All, and those in AOI.

- **Also…there is a UIC_Volumes_ALL folder in 00_Induced Seismicity Project**

- **Compilation Data pulls –** "Raw" monthly volume/pressure (yearly filings-1012A) data in .xls format.
- **Data byYear –** Cleaned up, broken out by year with locations in .xls format.
- **UIC Geodatabase –** Shapefile by year and month for wells with coordinates (NAD83 UTM Zone 14 projection). All formations/ all UIC wells.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 18, 2016 10:06 AM
To: 'Phillip Bailey'
Subject: RE: OCC_Project Startup Data

Thanks Phil!

Any thoughts on my presentation yesterday?

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 18, 2016 8:09 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: FW: OCC_Project Startup Data

Nancy,

See below.

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Tuesday, May 17, 2016 4:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Of course. Tell her I plan to call her and let her know my contact info
Cell 303 910 0760
julie@meqgeo.com

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 17, 2016 3:01 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I wanted to share the draft video with Nancy Dorsey that you provided of the WOK area because it is a unique visual of the dataset(s). Would you mind?

Regards,

Phillip Bailey
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p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 13, 2016 2:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

I should get the older injection data from you.

Here is a draft video, showing cumulative injection and time injection varying with seismicity in NW region….WOK and SRA areas.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 1:12 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: FW: OCC_Project Startup Data

Here's another way of addressing that question (start of injection) or observations of injection trends over time.

Regards,

Phillip Bailey
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Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Friday, May 13, 2016 2:10 PM
To: 'Julie Shemeta'
Cc: Charles Lord; Bob Griffith
Subject: FW: OCC_Project Startup Data

Yes, we're in the process of compiling this data for the wells in the AOI (~750 wells). And it's both **spud date** and **start of injection** that we're getting together. It may be another weeks or so before we have it ready and organized. See what we can do…(along with **KB**, **TD,** and **injection intervals**).

Regards,

Phillip Bailey
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Oklahoma Corporation Commission
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p.bailey@occemail.com

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 1:27 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip, do we have a spud data or start of injection data for the disposal wells? I have injection data loaded for everything you gave me, but I am curious which wells are "new" and which are the older injectors…
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 7:41 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

No, we do to IHS. We've been trying for the last month to activate our subscriptions though.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Friday, May 13, 2016 8:35 AM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Does the OCC have a DrillingInfo account by chance?
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 2:22 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

There are two files, "TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls", that have the point data.

Frac databases…not sure. I would have to check. I haven't come across any yet.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Thursday, May 12, 2016 3:18 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

You can also just give me the data points and I can let Transform make a horizon….

Thanks. I am just loading injection data now.
By chance, do you have a frac database with well locations/frac times/frac volumes by chance? Just curious to see how much activity is associated with fracs.
Julie

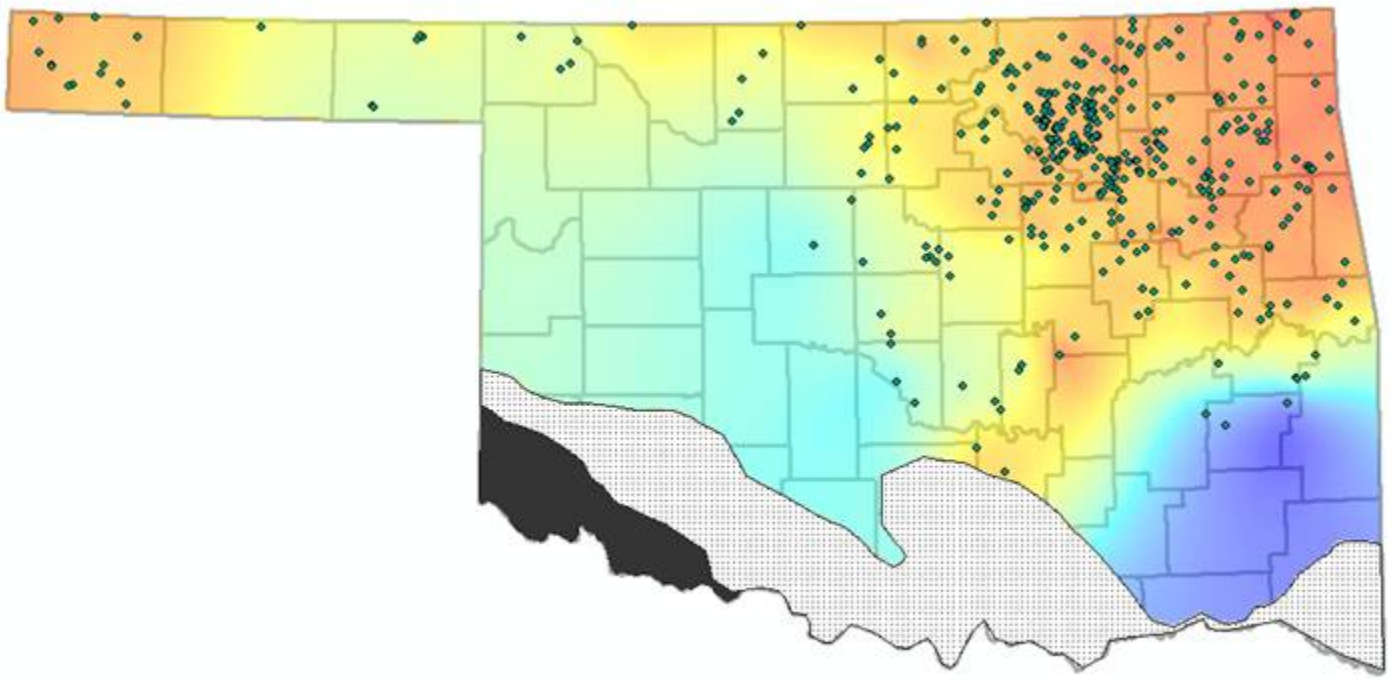
From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 12, 2016 1:27 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Julie,

I've included my attempts of converting the Top of Basement (feet subsea) surface to a file type that can easily be brought into Transform into "G&G_Shapefiles". I'm kind of at a lost of creating an ASCII XYZ. However, I tried (2) other options…

- Hz_bsmt_spline.asc and .prj → exported as ASCII
- Hz_bsmtsplm31 → exported as GRID

Note: Spline interpolation used. I digitzed a shapefile for where Cambrian-Ordovician outcrops exist to stop interpolations within those areas (used surface geology and gravity to highlight uplift areas and appropriate age rock units). There is also an area in SW OK where we had no data (but the Arbuckle likely exists in subsurface). Below is top of basement surface w/ associated estimated outcrop and no data areas. Data points for shown and included for reference ("TopBSMT_SS2.shp" and "TopBSMT_SS_mod_PAB.xls").



Let me know if this works. If so, I'll create a top of arbuckle surface as well.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 10, 2016 4:45 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Thanks!

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Tuesday, May 10, 2016 11:05 AM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

O sorry. I put the new 2016 daily data in your folder ("Current_DailyVol_Export").

Ok, awesome.

From: Julie Shemeta [mailto:julie@meggeo.com]
Sent: Tuesday, May 10, 2016 12:02 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Hi Phillip,
Let me know when you get the new injection file done. I will start on the older data to check for any issues.

I have a call in with a contact at IHS to see what 3D Surveys they know about, I will let you know what I find out.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Monday, May 09, 2016 4:35 PM
To: Julie Shemeta <julie@meggeo.com>
Subject: RE: OCC_Project Startup Data

Hi Julie,

I reviewed the 29 wells you flagged on Friday. I found most of the duplicates were indeed from the update. Others had more spurious data that indicated the operators updated their data before/after each update (in some cases substantial changes…). I want to run a few more traps first thing tomorrow with this 2016 dataset and then I will update the file in your folder ("Current_DailyVol_Export").

Also, I digitized a shapefile for data I dug up from TGS and SEI showing 3D seismic coverage throughout the state. In G&G Shapefiles→ "Seis_3D_All_OK". We'll update as we get more data in.

Regards,

Phillip Bailey
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p.bailey@occemail.com

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Thanks!

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To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

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Subject: FW: OCC_Project Startup Data

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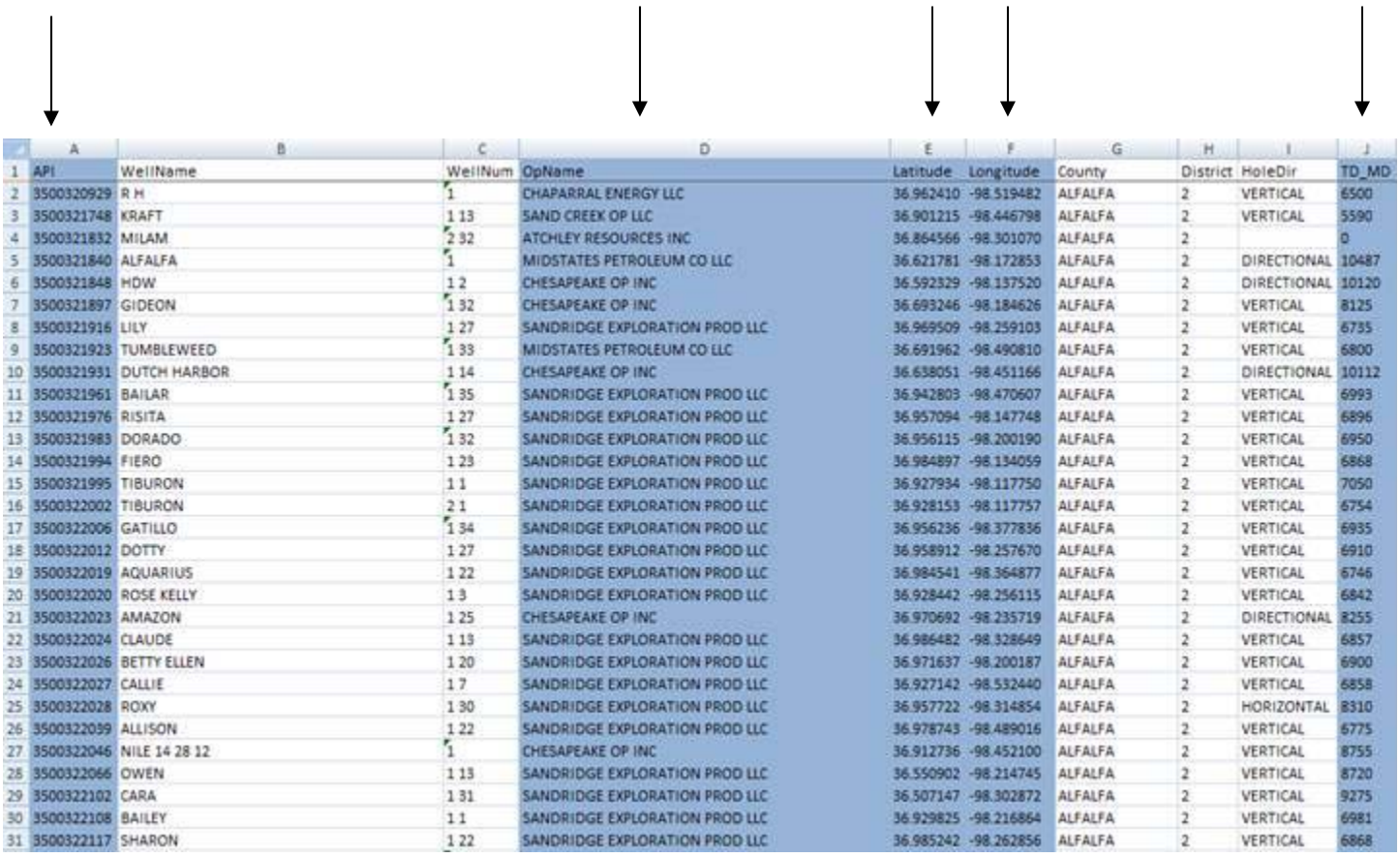
Ex.



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25	3500322028	ROXY	1 30	SANDRIDGE EXPLORATION PROD LLC	36.957722	-98.314854	ALFALFA	2	HORIZONTAL	8310
26	3500322039	ALLISON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.978743	-98.489016	ALFALFA	2	VERTICAL	6775
27	3500322046	NILE 14 28 12	1	CHESAPEAKE OP INC	36.912736	-98.452100	ALFALFA	2	VERTICAL	8755
28	3500322066	OWEN	1 13	SANDRIDGE EXPLORATION PROD LLC	36.550902	-98.214745	ALFALFA	2	VERTICAL	8720
29	3500322102	CARA	1 31	SANDRIDGE EXPLORATION PROD LLC	36.507147	-98.302872	ALFALFA	2	VERTICAL	9275
30	3500322108	BAILEY	1 1	SANDRIDGE EXPLORATION PROD LLC	36.929825	-98.216864	ALFALFA	2	VERTICAL	6981
31	3500322117	SHARON	1 22	SANDRIDGE EXPLORATION PROD LLC	36.985242	-98.262856	ALFALFA	2	VERTICAL	6868

Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:08 PM
To: 'Julie Shemeta'
Subject: FW: OCC_Project Startup Data

For KB's, depending on the completeness of what we have, I'm pretty sure we can extract a GL for wells using the DEM.

From: Phillip Bailey
Sent: Thursday, May 05, 2016 5:06 PM
To: 'Julie Shemeta'
Subject: RE: OCC_Project Startup Data

Yes to your first question, but…it may take a little digging/time to work with the database folks for KB and TD. KB has not really been captured (tabled) to my knowledge. I'll see what I have first thing tomorrow. Might have IHS data for now…

No, deviation surveys are not readily available especially in a tabled format (all pdf's of the survey reports). We have a couple here and there but for AOI HZ disposal wells, nothing substantial. Would it be good to have survey reports for what we have even if a few, or best to have a whole dataset?

From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Thursday, May 05, 2016 4:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

Phillip,
Is it possible to get a well list of the injection wells with API, well name, X, Y, operator, KB and TD?
Are deviation surveys available for the wells?
Thanks,
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, May 05, 2016 2:21 PM
To: julie@meqgeo.com
Cc: Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
Subject: OCC_Project Startup Data

Julie,

We've created a folder found via the path below.

ftp://ftp.occeweb.com/gismaps → Swarm Volume Data → 00_Induced Seismicity Project → JShemeta

In there are multiple folders. Below is a brief breakdown of what each contains.

- **DailyVolumes –** Daily volumes and pressures for all wells in the area of interest (n>700 wells) in *.xls* format.
  - **Current_2016** – Only 2016 to date (up to 3/31/2016)
  - **Historical_2012 thru 2015 -** ~2012 through 2015 (completeness of dataset is best 2014-2015)

- **AOI_AOR_Shapefiles –** Outlines of the area of interest and areas of reduction (NAD83 UTM Zone 14 projection)

- **Culture_Shapefiles –** Culture layers of state, county, waterbodies, etc. (NAD83 UTM Zone 14 projection)

- **DEM_30m –** Mosaic of 30m res DEM for state (NAD83 UTM Zone 14 projection)

- **G&G_Shapefiles –** Geology & Geophysical datasets (kind of thin now) including faults (OGS-2015), and surface geology (NAD83 UTM Zone 14 projection). We will send over a top of basement structure map (compiled from literature and logs) and Arbuckle isopach map (top calls from logs and completion reports) soon. We're in the process of updating these maps based on the additional well data we've received over the last several months and converting to grids that you can load into Transform. ASCII grids work??

- **UIC_InjWells -** UIC well spots (shapefiles) with borehole traces for those that are DIR/HZ. Separated by those TD'd in Cambrian-Ordovician age formations, All, and those in AOI.

- **Also…there is a UIC_Volumes_ALL folder in 00_Induced Seismicity Project**
    - **Compilation Data pulls –** "Raw" monthly volume/pressure (yearly filings-1012A) data in .xls format.
    - **Data byYear –** Cleaned up, broken out by year with locations in .xls format.
    - **UIC Geodatabase –** Shapefile by year and month for wells with coordinates (NAD83 UTM Zone 14 projection). All formations/ all UIC wells.

Regards,

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p.bailey@occemail.com

Dorsey, Nancy

From: Phillip Bailey <P.Bailey@occemail.com>
Sent: Tuesday, May 17, 2016 3:57 PM
To: Dorsey, Nancy
Subject: FW: OCC_Project Startup Data
Attachments: TestVideo_NW.mp4

Nancy,

Here is Julie's draft video based on initial work.

Regards,

Phillip Bailey
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Oklahoma Corporation Commission
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Oklahoma City, OK 73105
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p.bailey@occemail.com

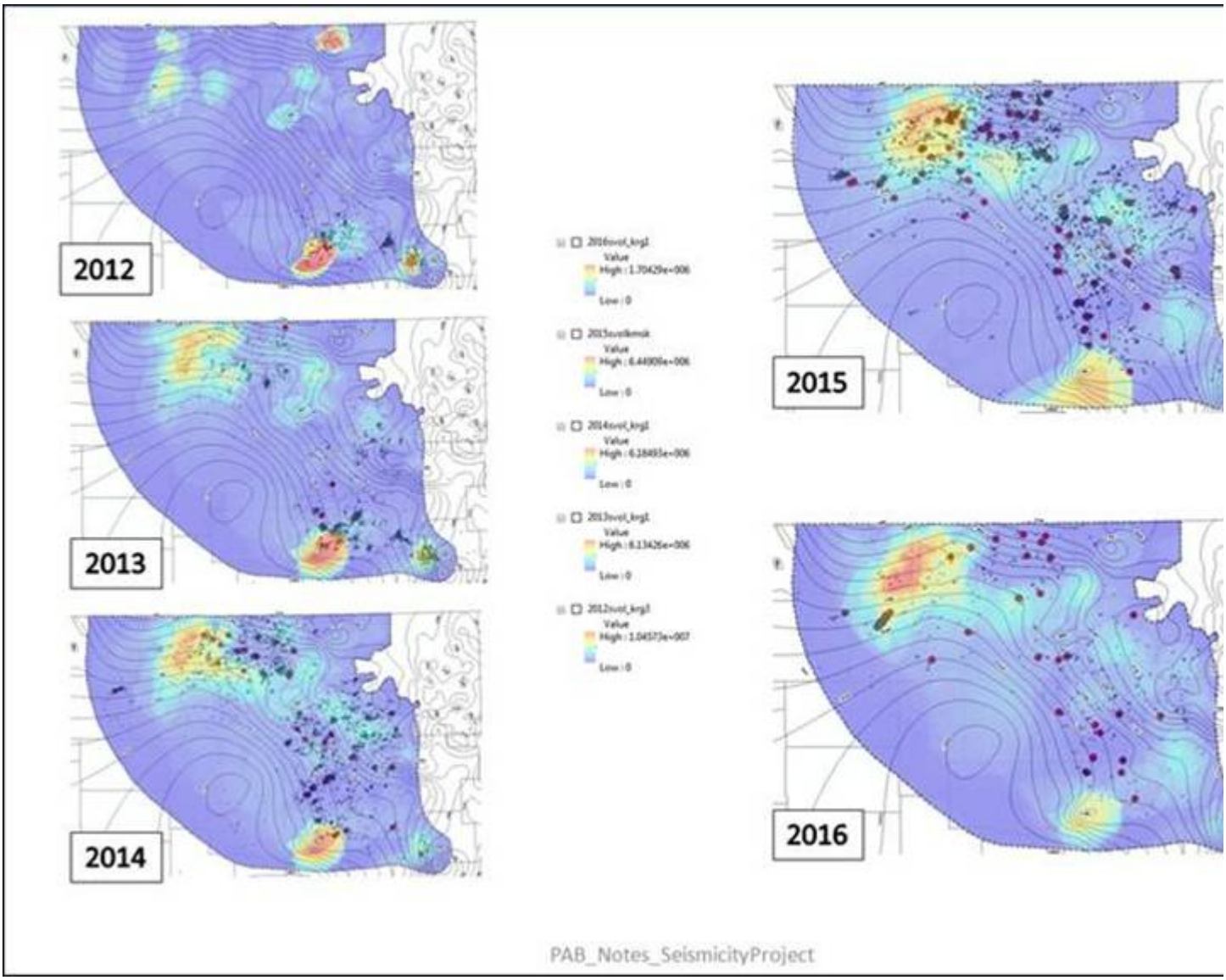
From: Julie Shemeta [mailto:julie@meqgeo.com]
Sent: Friday, May 13, 2016 2:53 PM
To: Phillip Bailey
Subject: RE: OCC_Project Startup Data

I should get the older injection data from you.

Here is a draft video, showing cumulative injection and time injection varying with seismicity in NW region….WOK and SRA areas.
Julie

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Friday, May 13, 2016 1:12 PM
To: Julie Shemeta <julie@meqgeo.com>
Subject: FW: OCC_Project Startup Data

Here's another way of addressing that question (start of injection) or observations of injection trends over time.



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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Tuesday, May 17, 2016 3:32 PM
To: Charles Lord; Jim Marlatt
Subject: Fairview presentation
Attachments: Fairview Area Seismicity Analysis.pdf

As requested! Are you allowed to share Julie's video?

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Monday, May 16, 2016 2:27 PM
To: 'Vicente Vasquez'
Subject: RE: dashboard latest version - comments

Exactly!

From: Vicente Vasquez [mailto:V.Vasquez@occemail.com]
Sent: Monday, May 16, 2016 2:10 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Jim Marlatt <J.Marlatt@occemail.com>; Phillip Bailey <P.Bailey@occemail.com>; Ron Clymer <R.Clymer@occemail.com>
Subject: RE: dashboard latest version - comments

Something like this?

(25 EQs selected, 3 wells selected)

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, May 16, 2016 2:07 PM
To: Vicente Vasquez; Jim Marlatt; Phillip Bailey; Ron Clymer
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Thanks Vincente that does answer a number of the points. Though some of my points were after polygon selection of both earthquakes and three wells. (No summary, incorrect cumulative) The cumulative was a straight line from bottom left to last value of the daily…the daily was not flat. Was that any clearer or still muddy?

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<P.Bailey@occemail.com>; Ron Clymer <R.Clymer@occemail.com>
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Thanks for your feedback Nancy,

I can shed light on a few of the comments here and will pass along comments to developers on bullet points we aren't sure on.

Ron has been tracking the "participation" of operators that are submitting their volume reports electronically. You're right, we are missing a lot of wells in the map/well grid at this point – but missing wells means they have not submitted an electronic record yet. The good thing is we know who has not submitted a report and have been notifying them to do so.

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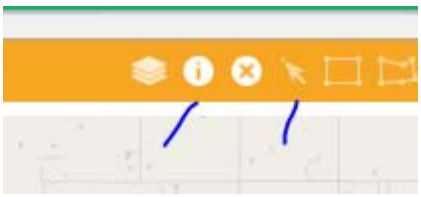

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I hope I answered some questions here and I will be sure to forward feedback for our phase II requests. We have some data cleanup on our end to do with our DB but so far the app is at least taking what we give it!

Let me know if you need anything – thanks again

Vicente Vasquez
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2101 N. Lincoln Boulevard

Oklahoma City, OK 73105
(405) 522-2802
v.vasquez@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, May 16, 2016 10:52 AM
To: Jim Marlatt; Phillip Bailey; Ron Clymer; Vicente Vasquez
Subject: dashboard latest version - comments

I am looking at the corner of Logan, Oklahoma and Lincoln Counties. I would have expected more wells in the area and seismicity in Lincoln Co., but maybe for the seismicity it's the timing (2016) data.

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OCC Well and Seismic Monitoring (**OWSM**)

Earthquake Grid

0 of 177 Selected

Origin Time	Mag	County	Depth (km)	M_Src	M_Type
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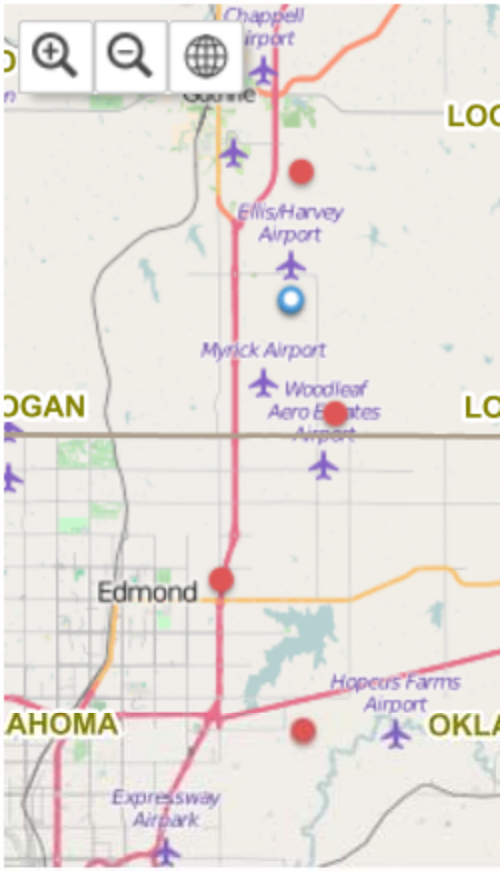
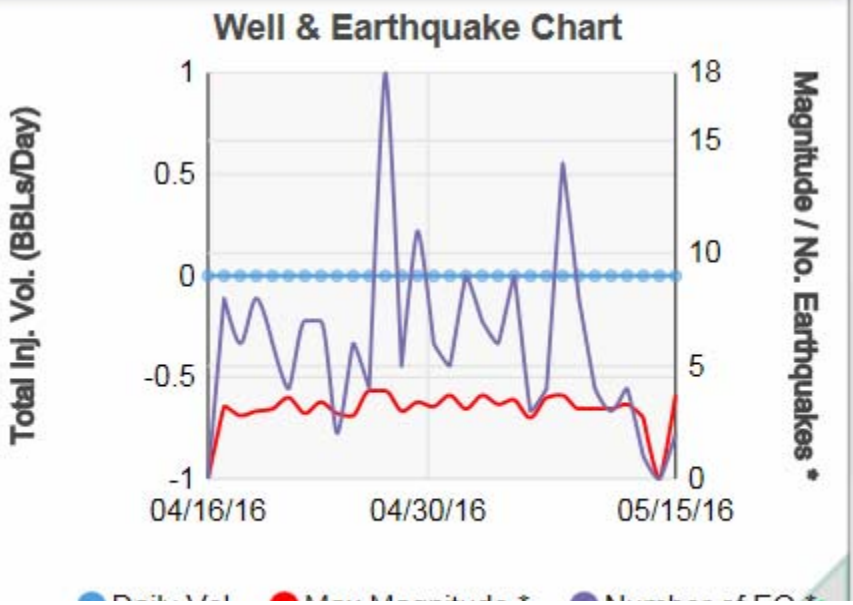


Well & Earthquake Chart

L30



Well Grid

1 of 334 Selected

API	Well Name
35-083-24032-00-00	HARVEY 1-11 SWD
35-151-	MEIER 2614

Nancy S. Dorsey
Environmental Scientist
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1445 Ross Ave. #1200
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FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

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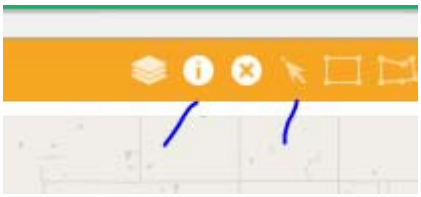

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(405) 522-2802
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From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, May 16, 2016 10:52 AM
To: Jim Marlatt; Phillip Bailey; Ron Clymer; Vicente Vasquez
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OCC Well and Seismic Monitoring (**OWSM**)

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0 of 177 Selected

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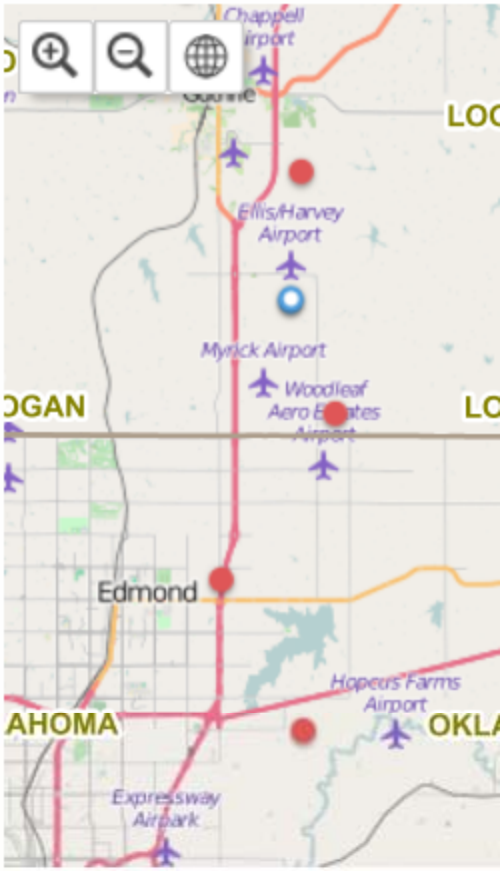

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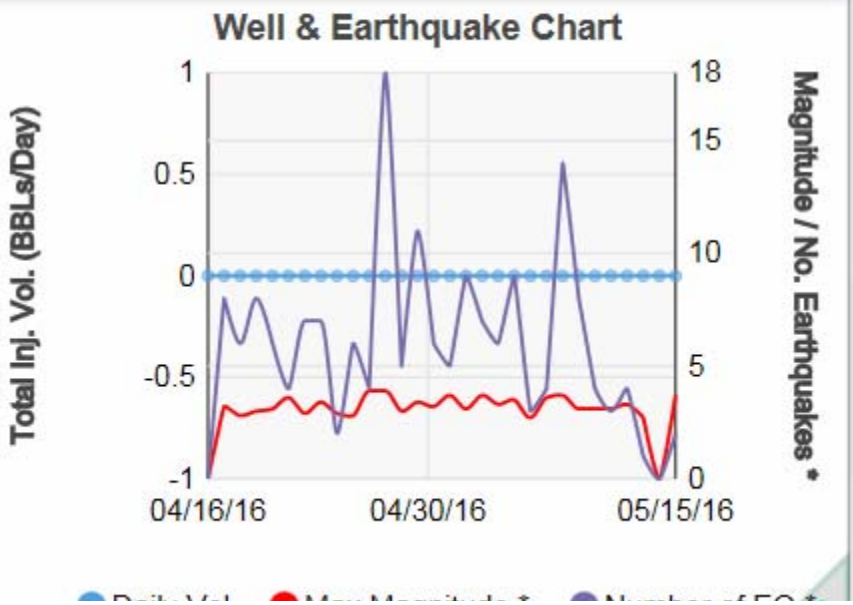
L30



Well Grid

1 of 334 Selected

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UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

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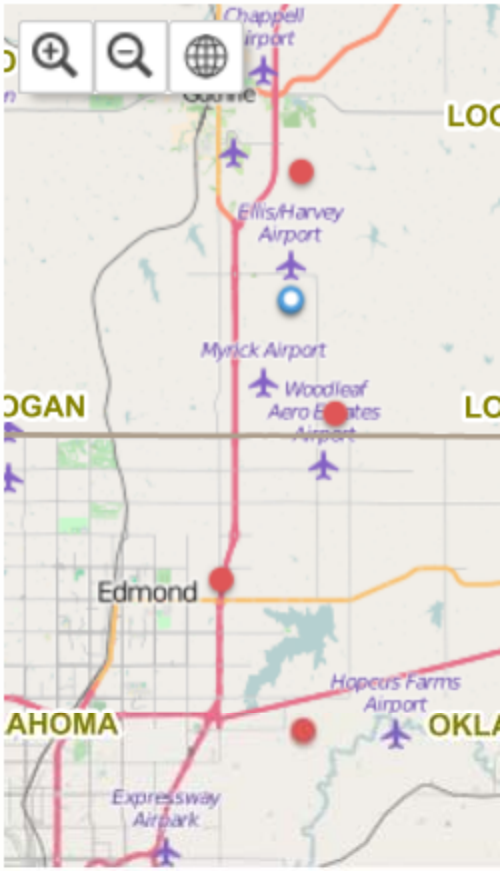
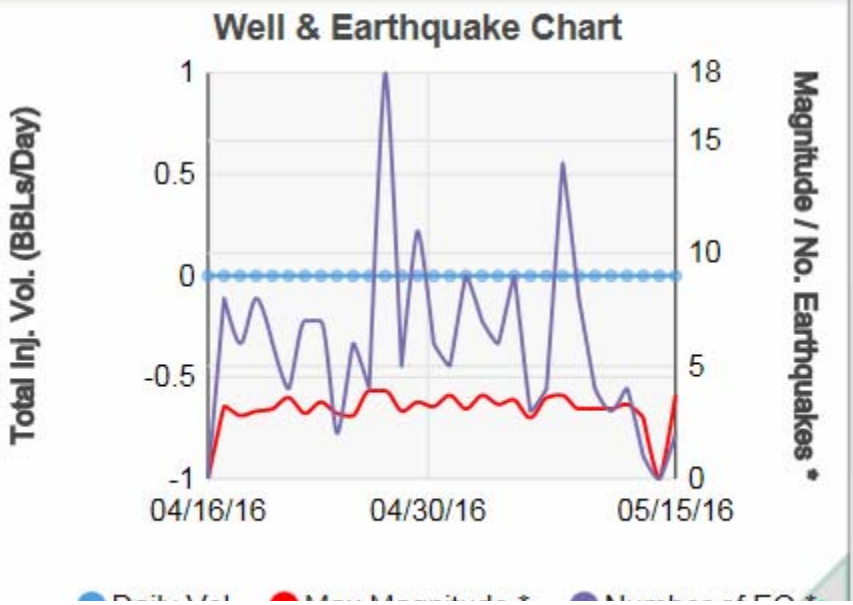
☐	05/12/2016 20:57	2.6	GRANT	5.0	OGS	ML
☐	05/12/2016 15:26	3	GRANT	3.9	OGS	ML
☐	05/12/2016 14:21	3.3	GARFIELD	7.3	OGS	ML

Map



Well & Earthquake Chart

L30



Well Grid

1 of 334 Selected

	API	Well Name
■	35-083-24032-00-00	HARVEY 1-11 SWD
☐	35-151-	MEIER 2614

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Monday, May 16, 2016 10:22 AM
To: 'Vicente Vasquez'; Charles Lord; Jim Marlatt; Phillip Bailey; Ron Clymer
Subject: RE: dashboard

It did finally load once I closed all the other windows in Explorer.

From: Vicente Vasquez [mailto:V.Vasquez@occemail.com]
Sent: Monday, May 16, 2016 10:21 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Charles Lord <C.Lord@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>; Phillip Bailey <P.Bailey@occemail.com>; Ron Clymer <R.Clymer@occemail.com>
Subject: RE: dashboard

Same issue on my end – both in IE and Chrome

I can contact Dottie to see if there is any maintenance going on

---

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, May 16, 2016 10:19 AM
To: Charles Lord; Jim Marlatt; Phillip Bailey; Ron Clymer; Vicente Vasquez
Subject: RE: dashboard

So far, the loading symbol (spinning) has been going on for several minutes. Maybe if I close Adobe. Nope, got the long-running script error. Now its back to loading……..

From: Charles Lord [mailto:C.Lord@occemail.com]
Sent: Monday, May 16, 2016 10:13 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject:

Would 10:00 AM tomorrow be suitable?

Let me know.

By the way here is the latest dashboard.

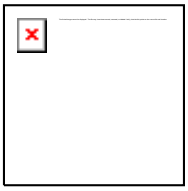
http://csweb.coordinatesolutions.com/UICSeismic2

Have not found any glitches yet.

I promised to respond by tomorrow afternoon.

Charles Lord
Senior Hydrologist
Oklahoma Corporation Commission
Post Office Box 52000

Oklahoma City, Oklahoma 73152
(405)522-2751
c.lord@occemail.com



Dorsey, Nancy

From: Dorsey, Nancy
Sent: Thursday, May 05, 2016 12:21 PM
To: Jim Marlatt; Phillip Bailey (P.Bailey@occemail.com); Ron Clymer (R.Clymer@occemail.com); Vicente Vasquez
Cc: Charles Lord; Tim Baker; Dellinger, Philip
Subject: FW: 1012D reporting issue 1

One other thought, if you provide the subtotal of the volumes, it provides the operator a quick check that they typed in the data correctly.

From: Dorsey, Nancy
Sent: Thursday, May 05, 2016 11:32 AM
To: Jim Marlatt <J.Marlatt@occemail.com>; Phillip Bailey (P.Bailey@occemail.com) <P.Bailey@occemail.com>; Ron Clymer (R.Clymer@occemail.com) <R.Clymer@occemail.com>; Vicente Vasquez <V.Vasquez@occemail.com>
Cc: Charles Lord <c.lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Dellinger, Philip <dellinger.philip@epa.gov>
Subject: RE: 1012D reporting issue 1

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  - The example screen shots are cut-off on the right.

        - Is there a well number actually shown? (RBDMS is notorious for leaving it off the displays.)
    - Additions to the User's Guide
        - Are you going to include your examples from under 1) in the AOI Operator 1012D_160426.pdf?
- Other
    - When the F1012D forms are uploaded to the web system, **please make sure the date consistently reflects the week the report applies to!** Consistent, meaning the eff/test date is either the last date of the report or the first, not the date filed. The scan date should be the filed or processed date.
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To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; ogvolumes <ogvolumes@occemail.com>; Tim Baker <T.Baker@occemail.com>; Charles Lord <C.Lord@occemail.com>
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4/15/2016	Denton 2513 1-28 SWD	35-151-24293-00-000	-11	10133
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As for the API #, whenever I'm loading data into your system via 1012D, I look up wells by permit or order number. I'm using the permit number 1504000024 to find the Denton well in your system. I found the order number on the disposal well permit for this well.

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Thank you,

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Underground Injection Control – Volume Reports
r.clymer@occemail.com
405-521-2278

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, May 04, 2016 3:37 PM
To: Phillip Bailey
Cc: James Phelps; Ron Clymer; Vicente Vasquez; Jim Marlatt
Subject: RE: reporting issue

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Nancy

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Regards,

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p.bailey@occemail.com

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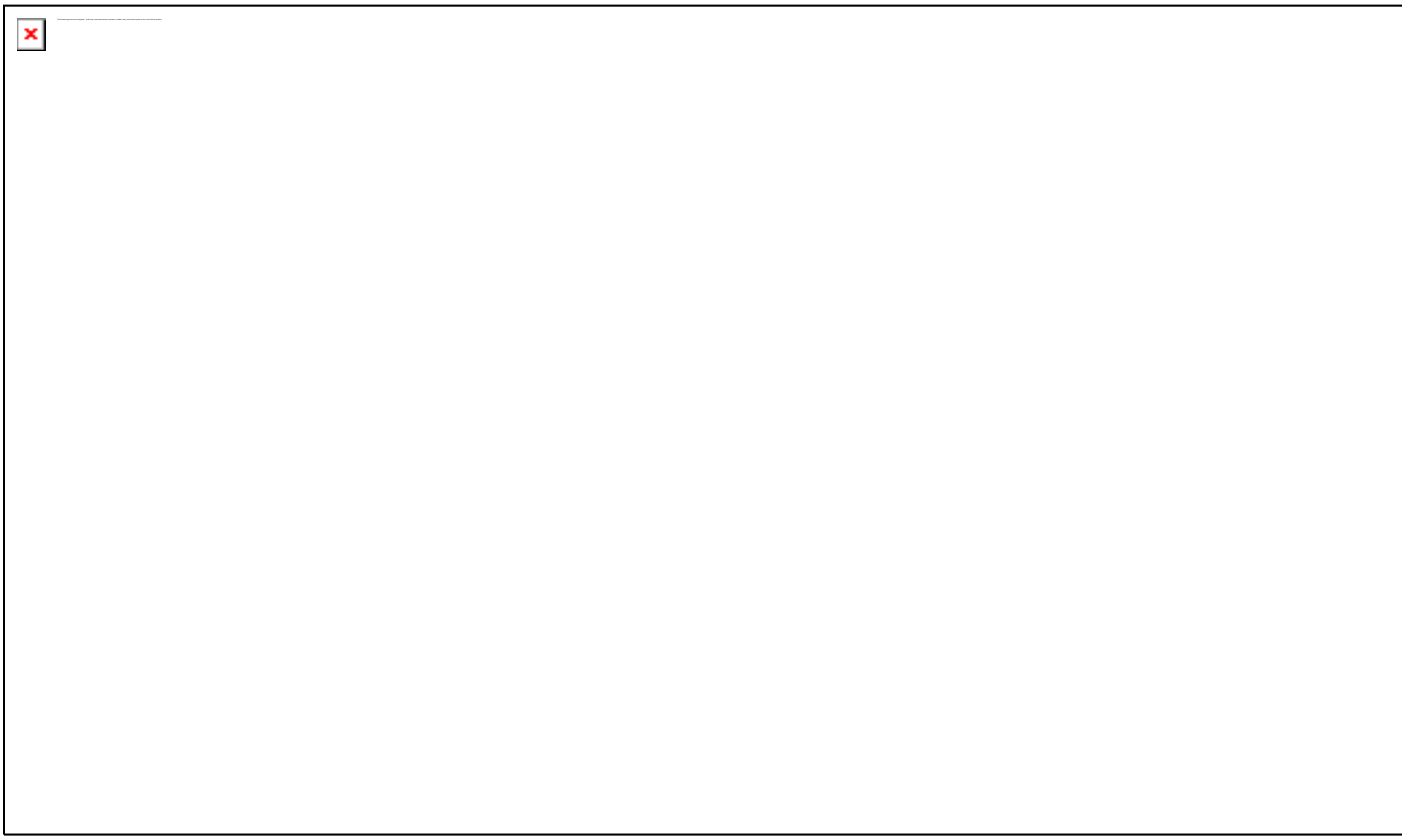
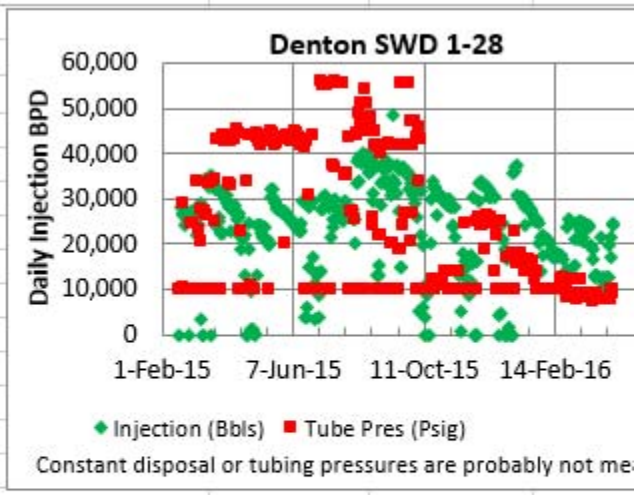


Snipping Tool

	A	B	C
4	API#	(10 digit)	3515124293
5	Permit #		
6	Operator #	**Midstates Petroleum**	23079
7	Operator Contact Phone #		(918) 947-8514
8	Lease, Name, Well #		Denton SWD 1-28
9	Legal Location	(sec-twn-rng)	28-25N-13W
10	County	County Name	Woods
11	Latitude	(Dec. deg - 6 decimal)	36.62260
12	Longitude	(Dec. deg - 6 decimal)	-98.59840
13	Injection Interval Top		
14	Injection Interval Bottom		
15	Formation(s)		Arbuckle
16	Packer depth	Ft.	6950'
17	Tubing size	In.	7"
18	Initial Injection	(Date of well's first injection)	3/14/2001



19	Number	Date	Injection (Bbls)	Tube Pres (Psig)	Cum (Bbls)	COMMENT	days
432	413	4/5/2016	12586	-10	9676578		
433	414	4/6/2016	19748	-10	9696326		
434	415	4/7/2016	21646	-10	9717972		
435	416	4/8/2016	16871	0	9734843		
436	417	4/9/2016	24100	0	9758943		
437	418	4/10/2016	24415	-4	9783358		
438							

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UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

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Regards,

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Snipping Tool

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12	Longitude	(Dec. deg - 6 decimal)	-98.59840
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14	Injection Interval Bottom		
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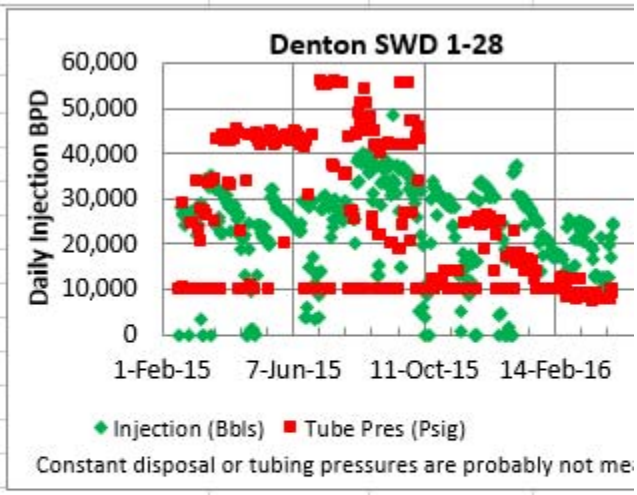

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436	417	4/9/2016	24100	0	9758943		
437	418	4/10/2016	24415	-4	9783358		
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UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

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Cc: James Phelps <J.Phelps@occemail.com>; Ron Clymer <R.Clymer@occemail.com>; Vicente Vasquez <V.Vasquez@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
Subject: RE: reporting issue

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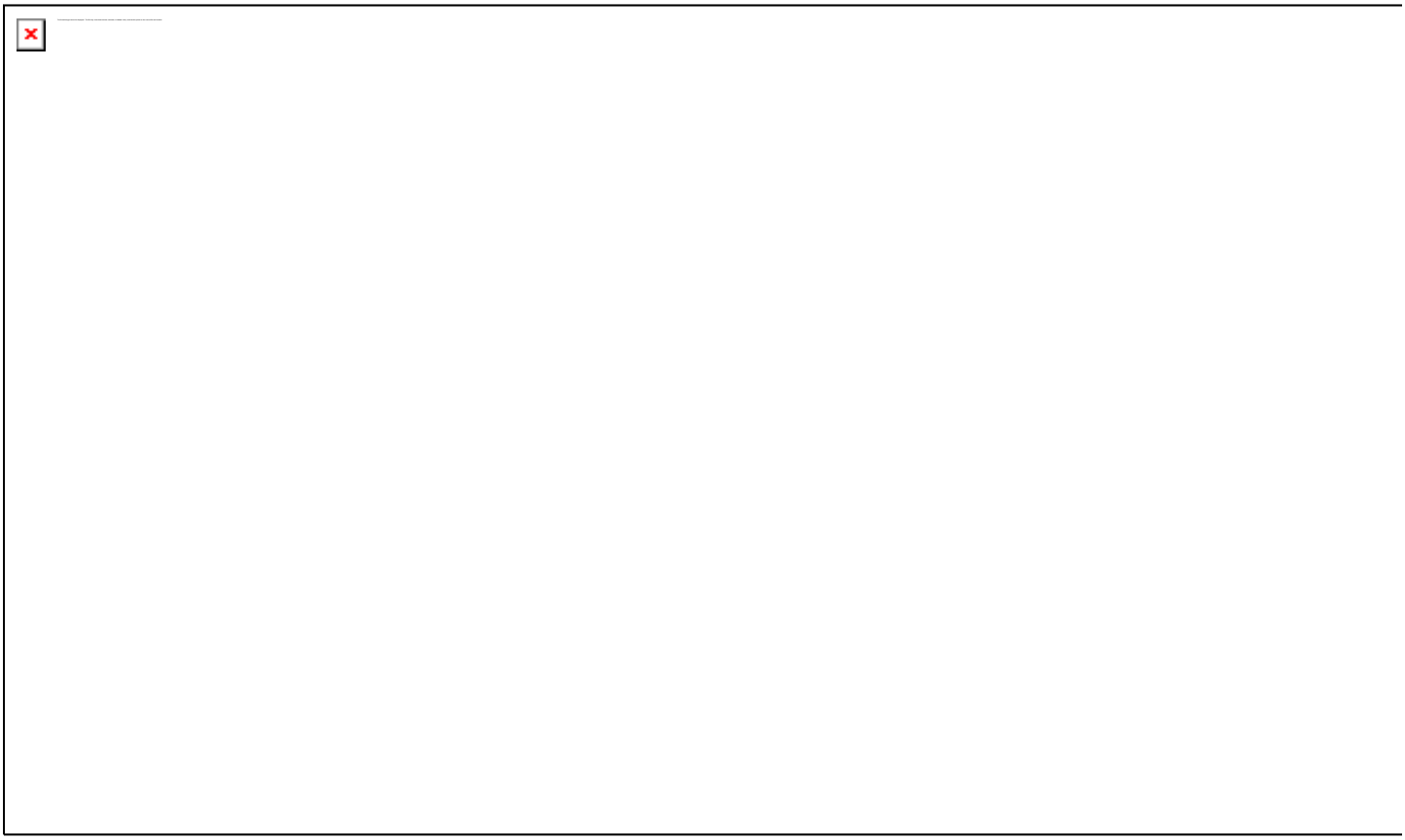
Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, May 04, 2016 3:08 PM
To: Phillip Bailey; James Phelps

Subject: reporting issue
Importance: High

The Daily spreadsheet lists a bad API and initial injection rate. It also lists the last point 4/10/16 as 24415 BBLs compared to the 23857 on the 1012D. Did the 1012D start on the wrong day?



Snipping Tool

	A	B	C
4	API#	(10 digit)	3515124293
5	Permit #		
6	Operator #	**Midstates Petroleum**	23079
7	Operator Contact Phone #		(918) 947-8514
8	Lease, Name, Well #		Denton SWD 1-28
9	Legal Location	(sec-twn-rng)	28-25N-13W
10	County	County Name	Woods
11	Latitude	(Dec. deg - 6 decimal)	36.62260
12	Longitude	(Dec. deg - 6 decimal)	-98.59840
13	Injection Interval Top		
14	Injection Interval Bottom		
15	Formation(s)		Arbuckle
16	Packer depth	Ft.	6950'
17	Tubing size	In.	7"
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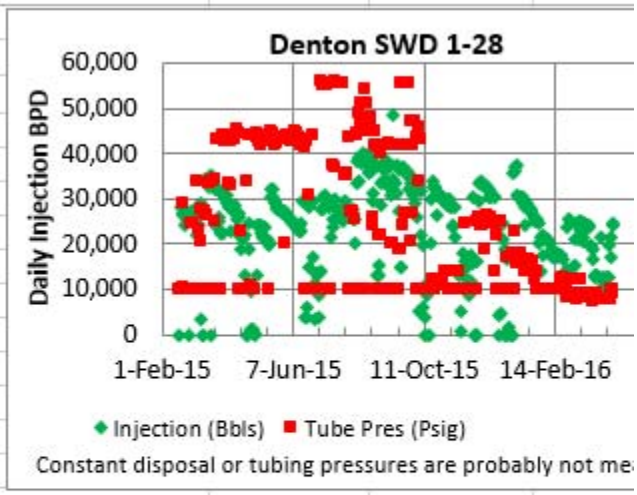

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 04, 2016 5:56 PM
To: 'Phillip Bailey'
Cc: James Phelps; Ron Clymer; Vicente Vasquez; Jim Marlatt
Subject: RE: reporting issue

Sorry, to be a pest!

The Zahorsky well also had no information for 1/1-1/17/2015.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 04, 2016 3:25 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: James Phelps <J.Phelps@occemail.com>; Ron Clymer <R.Clymer@occemail.com>; Vicente Vasquez <V.Vasquez@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
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To: Phillip Bailey; James Phelps
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Importance: High

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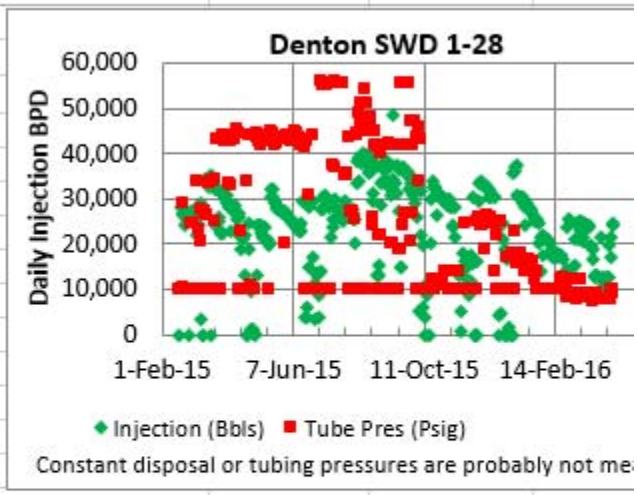

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 04, 2016 5:53 PM
To: 'Phillip Bailey'
Cc: James Phelps; Ron Clymer; Vicente Vasquez; Jim Marlatt
Subject: RE: reporting issue

Zahorsky well also has the intital date issue on the first 1012D. You need to check all of the Midstates wells.

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Sent: Wednesday, May 04, 2016 3:25 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
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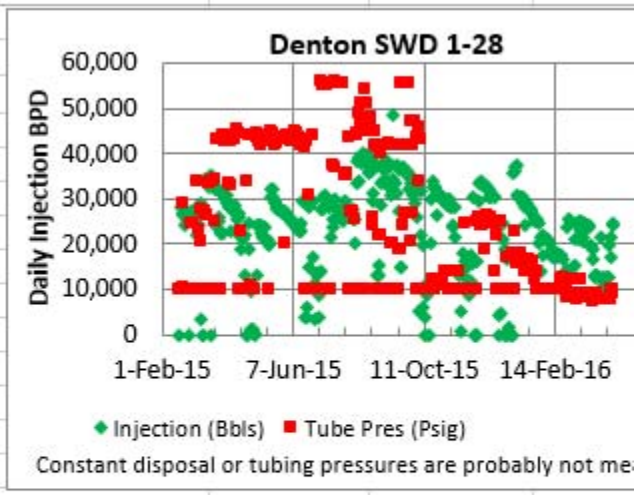

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, May 04, 2016 3:37 PM
To: 'Phillip Bailey'
Cc: James Phelps; Ron Clymer; Vicente Vasquez; Jim Marlatt
Subject: RE: reporting issue

Will do. I was wondering if the issue isn't how the 1012D start day/date was set-up. Does it require Sunday to Saturday? If so, you better bird dog the operators to actually read the dates or they will simply enter the next time period. I suspect that is what happened with this well, as if I assumed the data entered was for the anticipated week. The repeated Sunday value (on the 2nd or 3rd) next weekly entry did match.

I would like to see the packer and Tubing size included in these reports. There is no reliable source (not that this is either) available. The MITs frequently just parrot the permit data. Case in point this Denton 1-28 well, compare the F1075 and F1002a (laughable) and the permit and the survey and you get unequivocally unreliable data, as virtually nothing matches.

Nancy

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Wednesday, May 04, 2016 3:25 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: James Phelps <J.Phelps@occemail.com>; Ron Clymer <R.Clymer@occemail.com>; Vicente Vasquez <V.Vasquez@occemail.com>; Jim Marlatt <J.Marlatt@occemail.com>
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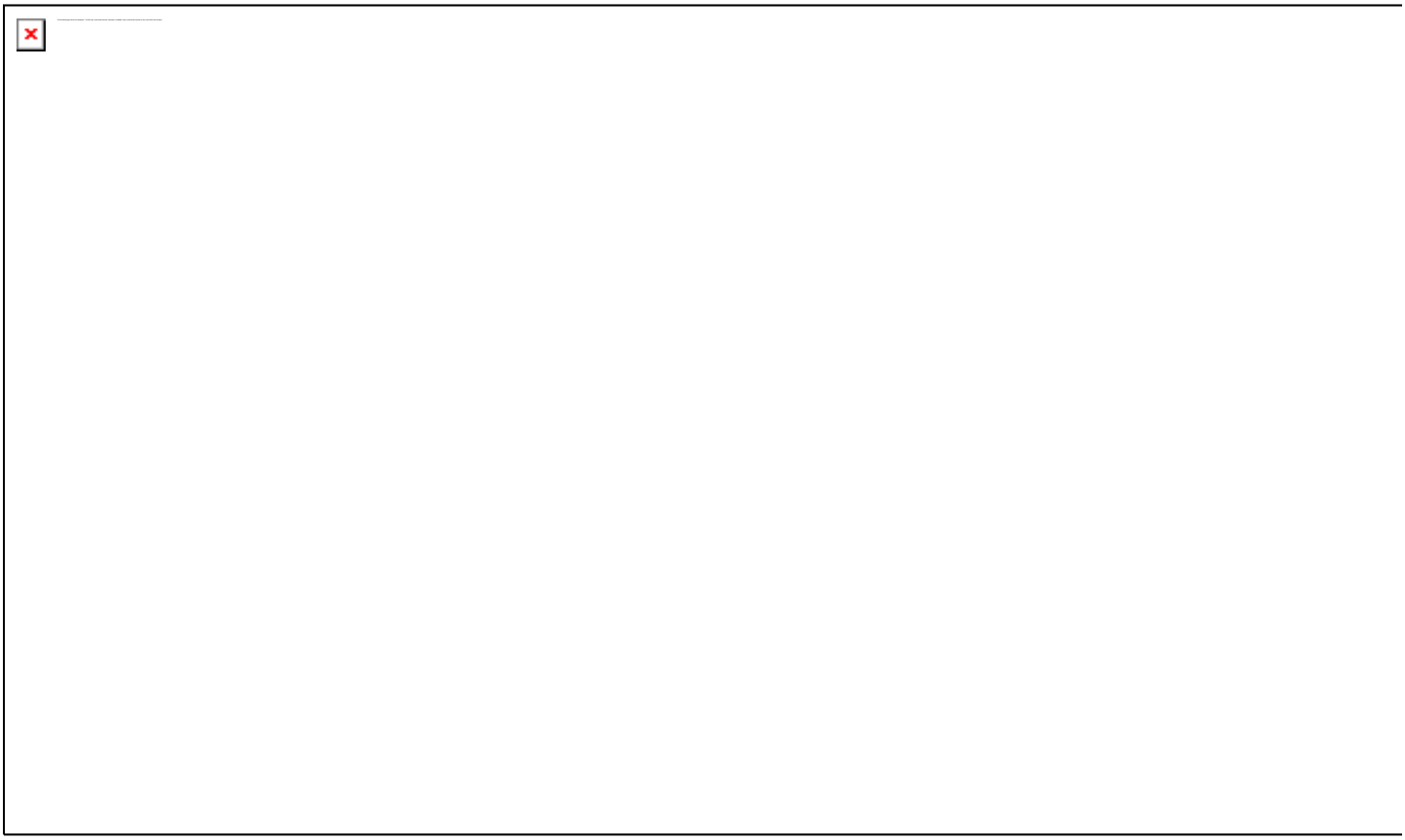

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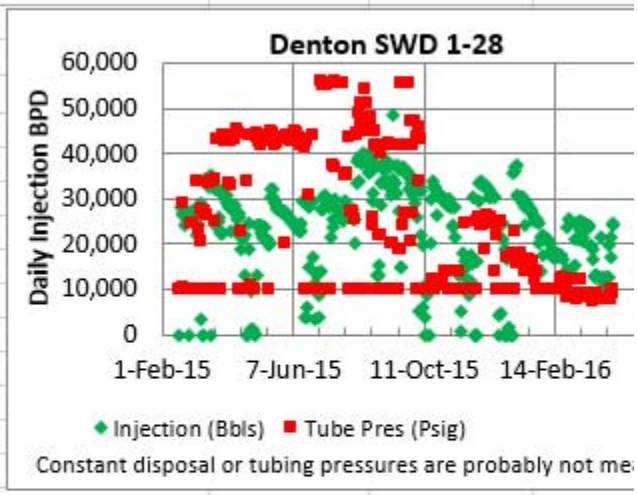

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Dorsey, Nancy

From: Dorsey, Nancy
Sent: Tuesday, May 03, 2016 3:05 PM
To: 'Jim Marlatt'
Cc: Charles Lord; Tim Baker; Cheryl Fitzgerald
Subject: RE: voluntary well reduction rate response results

Many thanks!

From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Tuesday, May 03, 2016 2:35 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Charles Lord <C.Lord@occemail.com>; Tim Baker <T.Baker@occemail.com>; Cheryl Fitzgerald <C.Fitzgerald@occemail.com>
Subject: RE: voluntary well reduction rate response results

Nancy, I have added the well counts below.

Thank you, and have a great day.

Jim Marlatt
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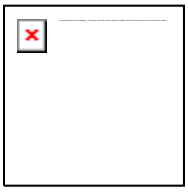

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Tuesday, May 03, 2016 2:16 PM
To: Jim Marlatt
Subject: RE: voluntary well reduction rate response results

Hi Jim,

Would it be easy to add the number of wells out of compliance and the total Reduction area well count? That way I could note something along the line of 'it appears that compliance has significantly improved since early March. With wells apparently out of compliance dropping from 30% to _'.

Thanks!
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Sent: Tuesday, May 03, 2016 2:08 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
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Central Oklahoma Reduction Area: **398** total wells in Central Reduction Area

Operator:	Current Volume	Target Volume	Well Count	Barrels per well out of compliance
Mar-Bar Ent.	3840	3476	1	364
Mid-States Petr.	20370	20301	6	11.5
Toomey Oil Co.	892	888	1	4

Western Oklahoma Reduction Area: **195** total wells in Western Reduction Area

Operator:	Current Volume	Target Volume	Well Count	Barrels per well out of compliance
Ross E Whitehead	3418	3385	1	33

The entire AOI included **772** wells.

Please let me know if you need any further clarifications.

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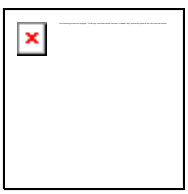

From: Matt Skinner
Sent: Monday, May 02, 2016 11:56 AM
To: Tim Baker
Cc: Charles Lord; Jim Marlatt
Subject: FW: voluntary well reduction rate response results

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Tuesday, March 01, 2016 10:15 AM
To: Matt Skinner; Phil Dellinger (delling.p88@gmail.com)
Cc: Charles Lord; Brown, Jamesr
Subject: voluntary well reduction rate response results

A quick comparison of the actual well daily average disposal volumes versus all the 267 rate reduction requests, indicates only 30% either maintained a reduced rate or shut-in as requested.

Obviously, some of these wells have received several—usually the second or third request has a higher daily volume average than the first!

Wells		Explanation
4	1%	These wells initially followed the request, then went above the rate
60	22%	These wells followed the request--though it may have taken a while
14	5%	The wells occasionally followed the request
40	15%	These wells were already below the requested rate
81	30%	These wells continued business as usual
22	8%	These wells are shut-in
217	267	

This is still a work in progress, but it is fairly complete. The followed or not includes no relationship to the deadline to accomplish it. So the Sandridge agreement, isn't actually in effect until the end of April, so almost all their wells show up as either 'ignored' or 'already' below the rate—since the timing was from over a year ago (1/1/2015) according to the release and the volumes listed.

Rather depressing really.

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Oklahoma Class II Program Manager
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Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Tuesday, May 03, 2016 2:35 PM
To: Dorsey, Nancy
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Attachments: removed.txt

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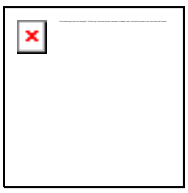

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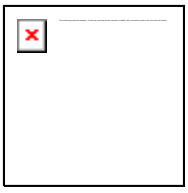

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60	22%	These wells followed the request--though it may have taken a while
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40	15%	These wells were already below the requested rate
81	30%	These wells continued business as usual
22	8%	These wells are shut-in
217	267	

This is still a work in progress, but it is fairly complete. The followed or not includes no relationship to the deadline to accomplish it. So the Sandridge agreement, isn't actually in effect until the end of April, so almost all their wells show up as either 'ignored' or 'already' below the rate—since the timing was from over a year ago (1/1/2015) according to the release and the volumes listed.

Rather depressing really.

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Tuesday, May 03, 2016 2:08 PM
To: Dorsey, Nancy
Cc: Charles Lord; Tim Baker; Cheryl Fitzgerald
Subject: RE: voluntary well reduction rate response results
Attachments: removed.txt

Nancy,

Thank you for identifying these areas of concern. We have reviewed your file, and have checked the current compliance status for all the operators in the AOI. Nearly all operators are in compliance with the current directives, and while there are no egregious violations, the following operators have been identified as being out of compliance:

Central Oklahoma Reduction Area:

Operator:	Current Volume	Target Volume
Mar-Bar Ent.	3840	3476
Mid-States Petr.	20370	20301
Toomey Oil Co.	892	888

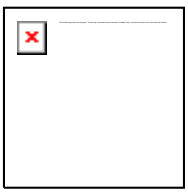
Western Oklahoma Reduction Area:

Operator:	Current Volume	Target Volume
Ross E Whitehead	3418	3385

Please let me know if you need any further clarifications.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Matt Skinner
Sent: Monday, May 02, 2016 11:56 AM
To: Tim Baker
Cc: Charles Lord; Jim Marlatt
Subject: FW: voluntary well reduction rate response results

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Tuesday, March 01, 2016 10:15 AM
To: Matt Skinner; Phil Dellinger (delling.p88@gmail.com)
Cc: Charles Lord; Brown, Jamesr
Subject: voluntary well reduction rate response results

A quick comparison of the actual well daily average disposal volumes versus all the 267 rate reduction requests, indicates only 30% either maintained a reduced rate or shut-in as requested.

Obviously, some of these wells have received several—usually the second or third request has a higher daily volume average than the first!

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Dorsey, Nancy

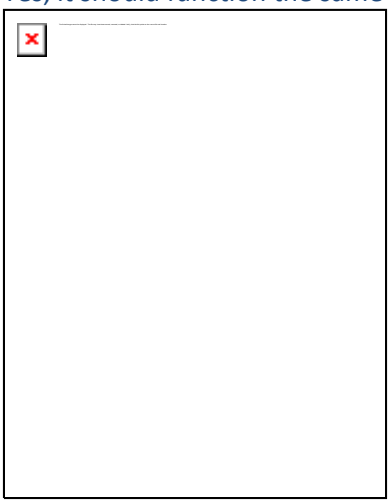
From: Dorsey, Nancy
Sent: Tuesday, May 03, 2016 1:27 PM
To: 'Vicente Vasquez'
Subject: RE: test run

Hm, thanks I will try it again using your directions!

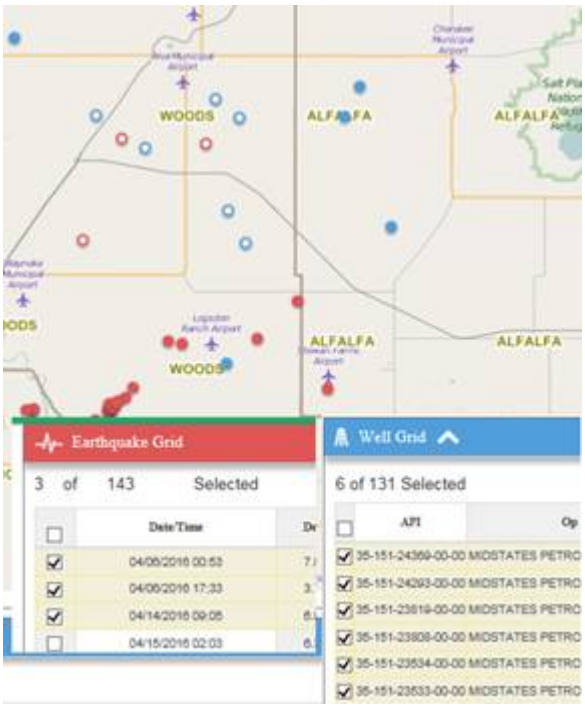
From: Vicente Vasquez [mailto:V.Vasquez@occemail.com]
Sent: Tuesday, May 03, 2016 1:17 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: test run

Nancy,

Yes, it should function the same way – I drew a polygon,



Double click the polygon to terminate drawing - the polygon disappears, but the EQ's will be selected in the Grid, and Wells based on the polygon

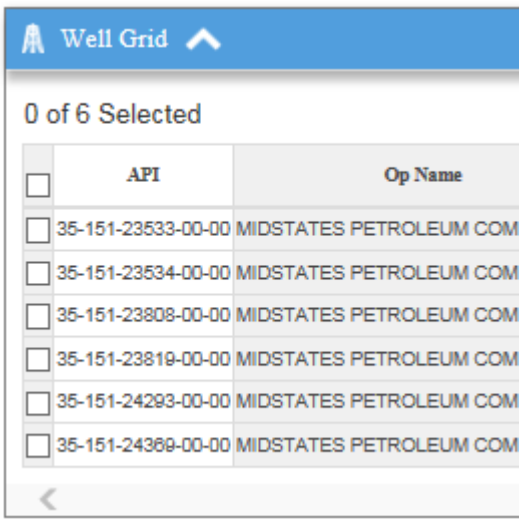


Now in the Well Grid > Filters > Filter by Selected > the remaining 6 wells will be left in the grid view ready for download. The Map should autozoom to your selection as well.

NOTE

The charts to the left will display what is selected in the EQ & Well grid, OR if nothing in selected in well grid, will default display *the entire contents of the well grid.*

Filtering by selection auto-deselects the wells in the well grid



but since they are the only wells remaining in the well grid at the time (and the EQ's are still selected by your polygon), the charts will be representative of the polygon well set.

Let me know if you need anything else! I'm still playing with this myself so I'm learning a lot.

V

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Tuesday, May 03, 2016 12:05 PM
To: Vicente Vasquez
Subject: RE: test run

I wanted to select based on the polygon I drew, not a preset buffer around the wells. Is that possible?

From: Vicente Vasquez [mailto:V.Vasquez@occemail.com]
Sent: Tuesday, May 03, 2016 11:45 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Charles Lord <C.Lord@occemail.com>
Subject: RE: test run

Thank you Nancy! – I will add to the list for delivery to the dev. Team.

I can help with one aspect – but I agree this tool will work best when it is easy to use and intuitive.

To trim your results for download you

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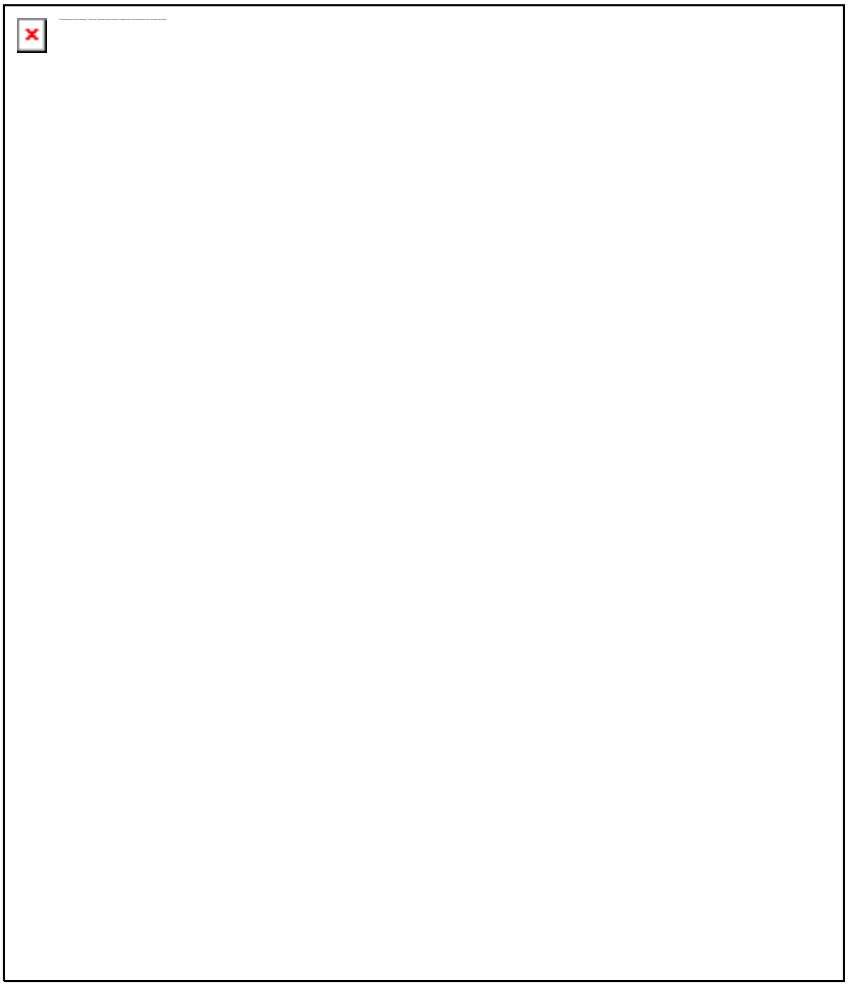
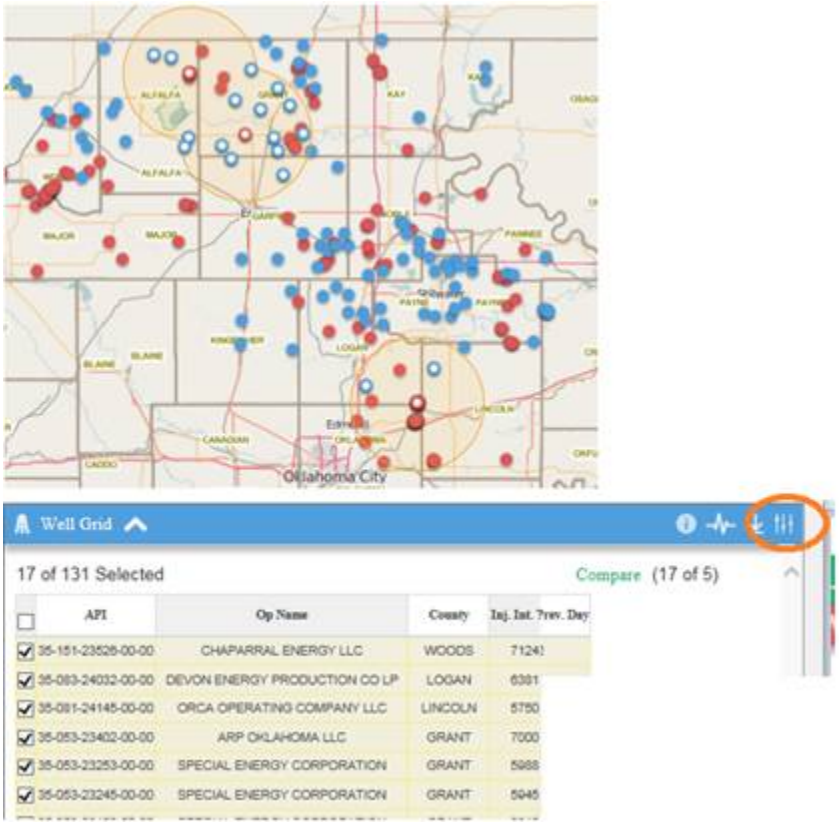
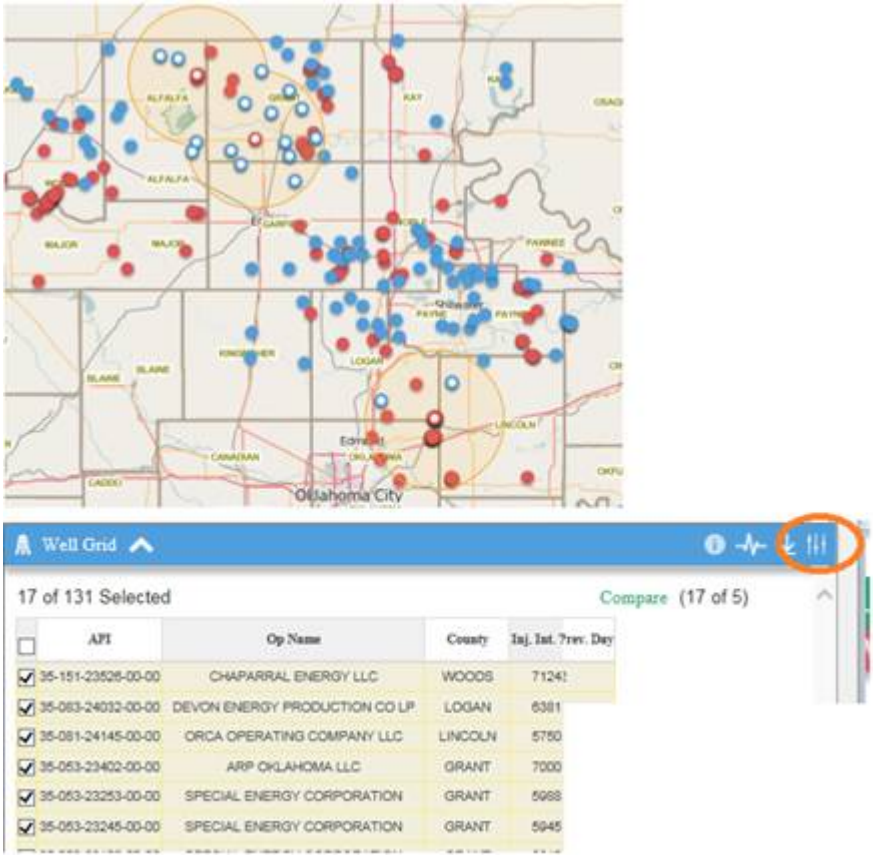


2) Resulting wells will be shown and selected – chose the filter Icon in the Well grid window



Select “filter by selected” and the APPLY – the remaining wells should be the only ones in the well grid to download



Thanks again for your feedback – let me know if you need anything

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To: Vicente Vasquez; Charles Lord
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The pop-up summary tables do not stay within the screen—which makes them unusable sometimes.

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Sent: Wednesday, April 27, 2016 4:31 PM
To: Charles Lord <C.Lord@occemail.com>; Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: test run

Charles,

Yes I am working on collating comments – sorry I missed this response earlier! - email slipped though some cracks it seems.

I'll add Nancy's comments to the list and please send along any other observations/questions.

Thanks and have a great afternoon,

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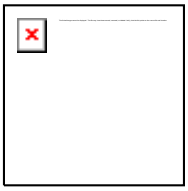

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To: Charles Lord
Cc: Dellinger, Philip
Subject: RE: test run

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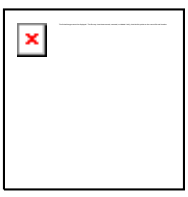

From: Charles Lord
Sent: Tuesday, April 26, 2016 3:04 PM
To: 'c.lord@cox.net'
Subject: FW:

From: Charles Lord
Sent: Tuesday, April 26, 2016 3:03 PM
To: Ron Clymer
Subject:

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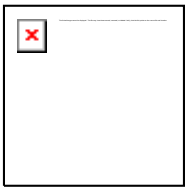

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Tuesday, May 03, 2016 12:07 PM
To: Jim Marlatt
Cc: Charles Lord
Subject: Arbuckle well BHP runs?

Hi Jim,

Are the BHP runs required of the Arbuckle wells in an accessible location (to me)? I was looking for the Midstates Denton well, to start with. I didn't see any pressure data in their Swarm Volume folders.

Thanks,
Nancy

Nancy S. Dorsey
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UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches: http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

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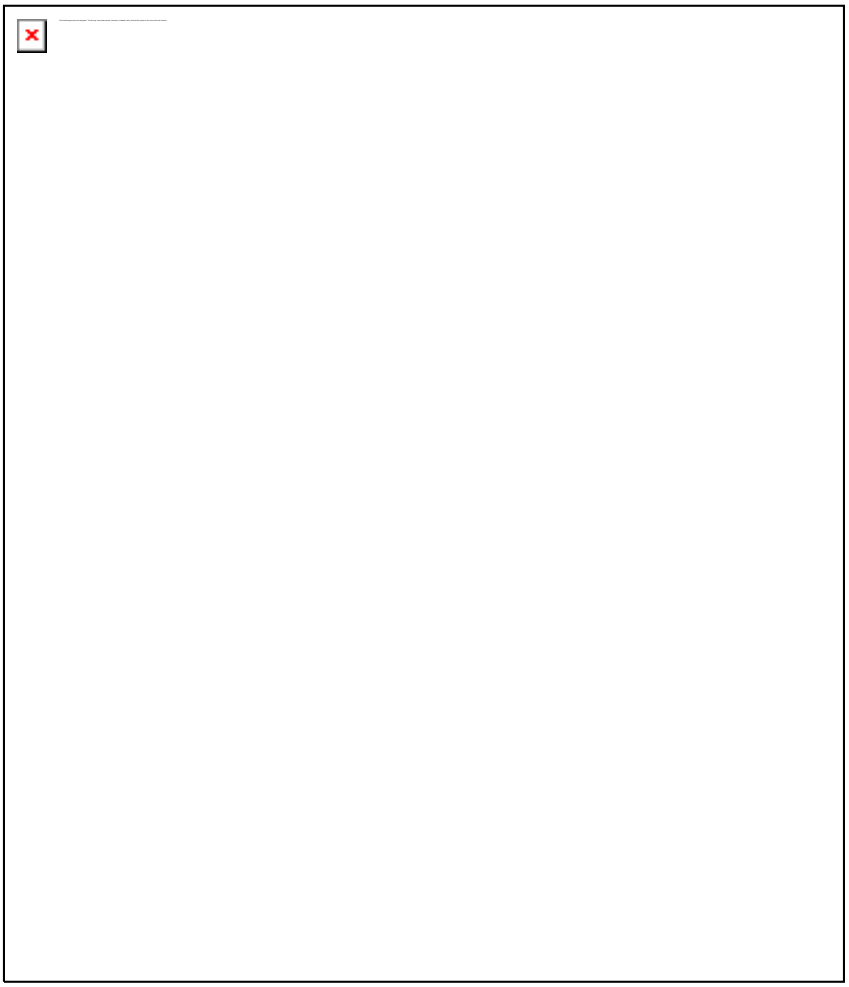

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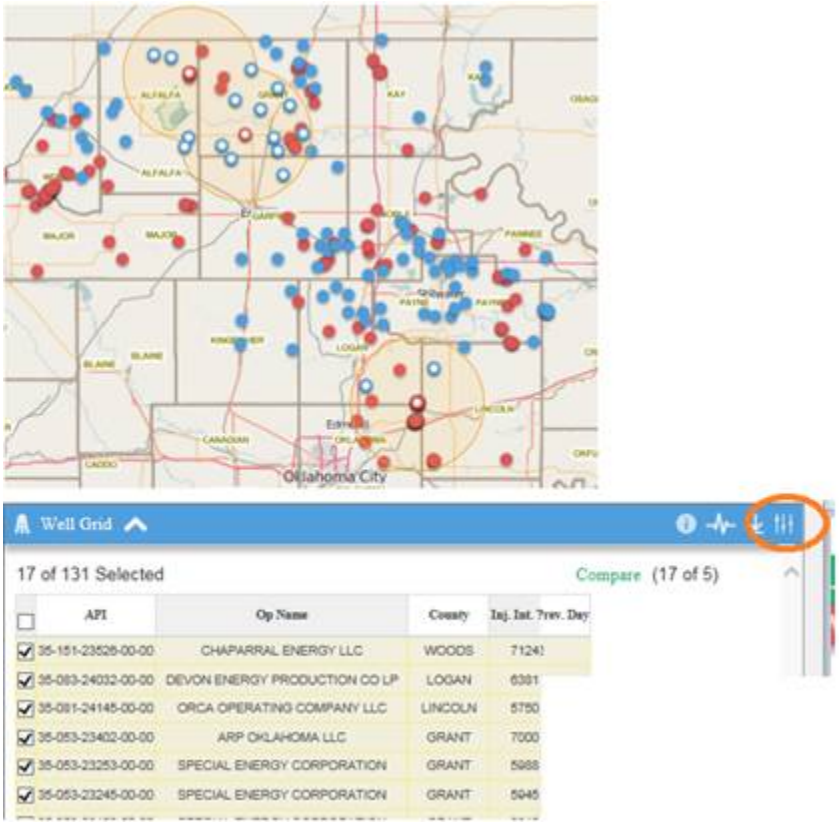

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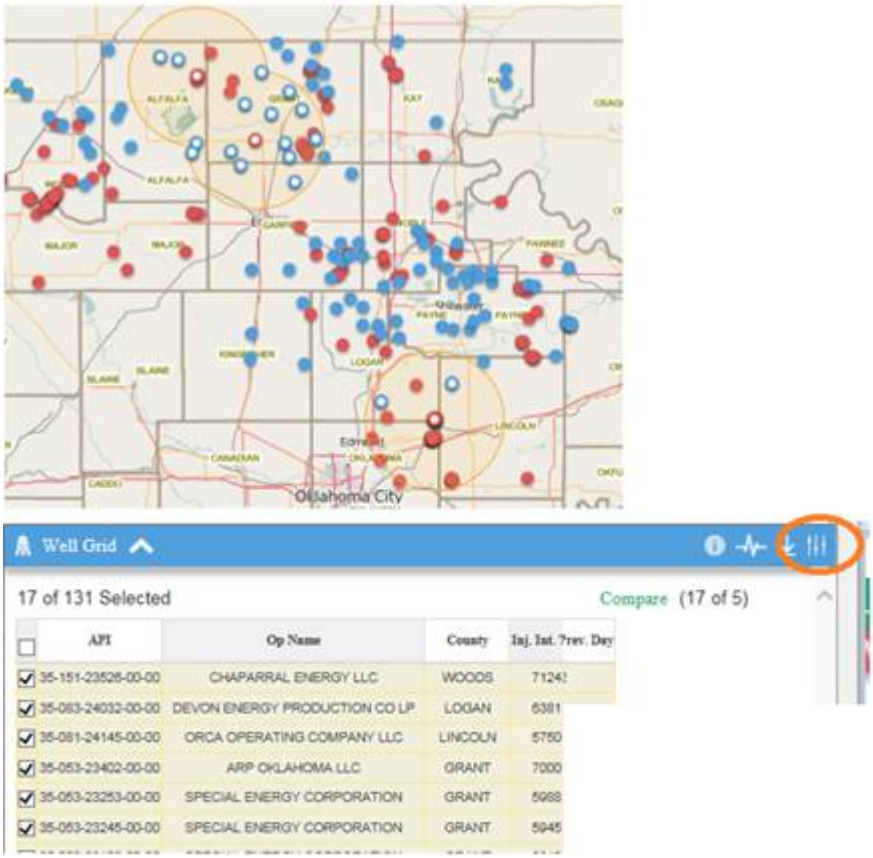

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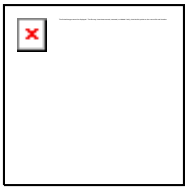

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Sent: Tuesday, April 26, 2016 3:36 PM
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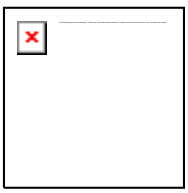

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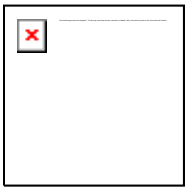

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Tuesday, May 03, 2016 11:30 AM
To: 'Vicente Vasquez'
Subject: RE: test run - more

Permit_OrderNumbers contains concatenated data. See API 35-037-28759-00-00

Repetition, that any output needs to include a note about the range of available data. i.e that the previous 30 day data is all 0 connects to the fact there was no data entered for that period.

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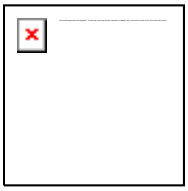

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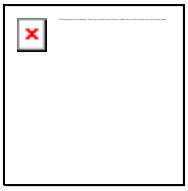
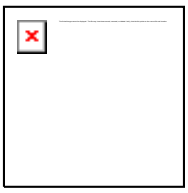


From: Charles Lord
Sent: Tuesday, April 26, 2016 3:04 PM
To: 'c.lord@cox.net'
Subject: FW:

From: Charles Lord
Sent: Tuesday, April 26, 2016 3:03 PM
To: Ron Clymer
Subject:

Http://csweb.coordinatesolutions.com/UICSeismic

Charles Lord
Senior Hydrologist
Oklahoma Corporation Commission
Post Office Box 52000
Oklahoma City, Oklahoma 73152
(405)522-2751
c.lord@occemail.com



Dorsey, Nancy

From: Dorsey, Nancy
Sent: Tuesday, May 03, 2016 11:25 AM
To: 'Vicente Vasquez'; Charles Lord
Subject: RE: test run

Hi Vincente,

A few more comments, I may have missed.

The pop-up summary tables do not stay within the screen—which makes them unusable sometimes.

Last night I selected an area and downloaded the wells and events. I got all the events and all the wells. Doesn't mean it wasn't operator error, I had no patience to try and wade through the 'instructions'—way to wordy. Maybe as one option, but if someone wants to find how to do something it needs to be quickly obvious.

There really needs to be a legend on the map.

There should be a way to print the view or create a jpg for later printing.

Maybe not 2 cents worth, but there it is. ☺

Nancy

From: Vicente Vasquez [mailto:V.Vasquez@occemail.com]
Sent: Wednesday, April 27, 2016 4:31 PM
To: Charles Lord <C.Lord@occemail.com>; Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: test run

Charles,

Yes I am working on collating comments – sorry I missed this response earlier! - email slipped though some cracks it seems.

I'll add Nancy's comments to the list and please send along any other observations/questions.

Thanks and have a great afternoon,

Vicente Vasquez
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard
Oklahoma City, OK 73105
(405) 522-2802
v.vasquez@occemail.com

From: Charles Lord
Sent: Wednesday, April 27, 2016 9:42 AM

To: Dorsey, Nancy
Cc: Vicente Vasquez
Subject: RE: test run

That was quick!

Thanks for taking time to review this.

We will send our recommendations to Coordinate Solutions next Tuesday.

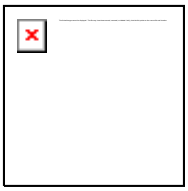
If you find anything else please let us know.

Vicente will put together the final list and do the Dee Dupes (new word from consultant, Delete Duplications).

Please send to Vicente and copy me.

Hope things are going well,

Charles Lord
Senior Hydrologist
Oklahoma Corporation Commission
Post Office Box 52000
Oklahoma City, Oklahoma 73152
(405)522-2751
c.lord@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Tuesday, April 26, 2016 3:36 PM
To: Charles Lord
Cc: Dellinger, Philip
Subject: RE: test run

Intriguing! I assume this only has one or two weeks of daily data loaded, based on the erratic volume data?

Some quick thoughts.

- I really like the compare option for the wells! But even for me the graph has too much disparate information. Maybe dashed or dots for the pressures and solid lines for the bbls?
- Using it isn't immediately intuitive, but I could walk it fairly quickly.
- The so called summary in the well grid is apparently the actual well data.
- The average plot is meaningless under cumulatives—don't bother if they are only going to straight line start to finish.

- The charts need axis titles
    - An end of volumetric data should be included otherwise it will always imply the wells were not disposing at the time of the recent event.
- The filter instructions for the well grid:
    - CAPS ONLY with * wildcard
    - (Not all data entered)
- A pressure plot (max range—above 0 only) would also be interesting versus the earthquakes
- The summary option on the map doesn't appear to do anything.
- A way to select the AOI or AOR data would be helpful

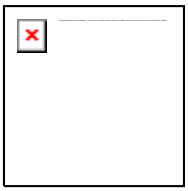
From: Charles Lord [mailto:C.Lord@occemail.com]
Sent: Tuesday, April 26, 2016 3:08 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: FW:

We are beta testing this.

Http://csweb.coordinatesolutions.com/UICSeismic

Ignore it if you can.

Charles Lord
Senior Hydrologist
Oklahoma Corporation Commission
Post Office Box 52000
Oklahoma City, Oklahoma 73152
(405)522-2751
c.lord@occemail.com

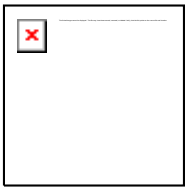


From: Charles Lord
Sent: Tuesday, April 26, 2016 3:04 PM
To: 'c.lord@cox.net'
Subject: FW:

From: Charles Lord
Sent: Tuesday, April 26, 2016 3:03 PM
To: Ron Clymer
Subject:

Http://csweb.coordinatesolutions.com/UICSeismic

Charles Lord
Senior Hydrologist
Oklahoma Corporation Commission
Post Office Box 52000
Oklahoma City, Oklahoma 73152
(405)522-2751
c.lord@occemail.com



Dorsey, Nancy

From: Johnson, Ken-E
Sent: Monday, May 02, 2016 9:19 AM
To: Dorsey, Nancy
Subject: FW: Stasta Hunton 1 in Wilzetta field

FYI – has she emailed you? Can you respond to her?

From: Araya Vann [mailto:arayavann@yahoo.com]
Sent: Sunday, May 01, 2016 10:06 AM
To: Johnson, Ken-E
Subject: Stasta Hunton 1 in Wilzetta field

How was the the result of Fall-0ff test?. Tim asked me to check all the report of F1002A, any hearing cases which involve with this well. But after I reported to Charles, I have not receive any correspondences between OCC and EPA.

On February 2015, EPA recommended the Hall plots for the areas of Earth quake, and I found only one CD - case docket which was presented to OCC. If OCC does not have the records of the older wells before 2009 (I think), how can you find the effective of flow from other wells toward Faults?

Earthquake is still happened in Oklahoma, but nothing referred to SWD. O.U. also received more tools for their Geophysics Department. Most likely, we are continue study on Geophysics - Earthquake in Oklahoma.

Best Regards,
Araya C. Vann

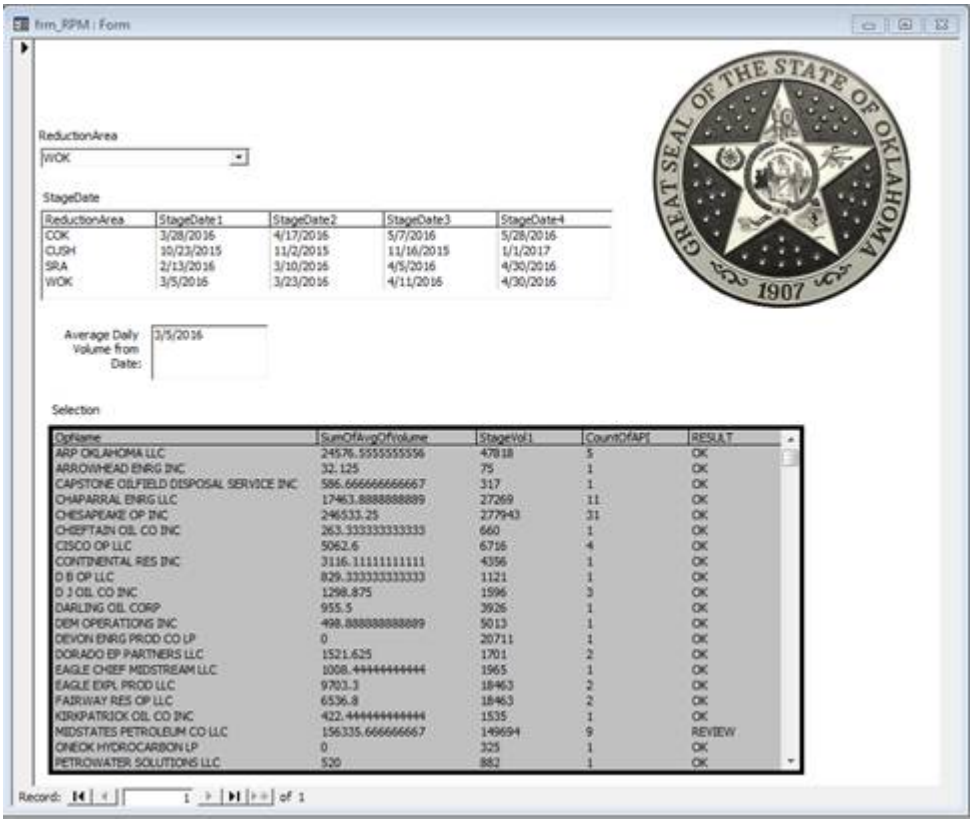
Dorsey, Nancy

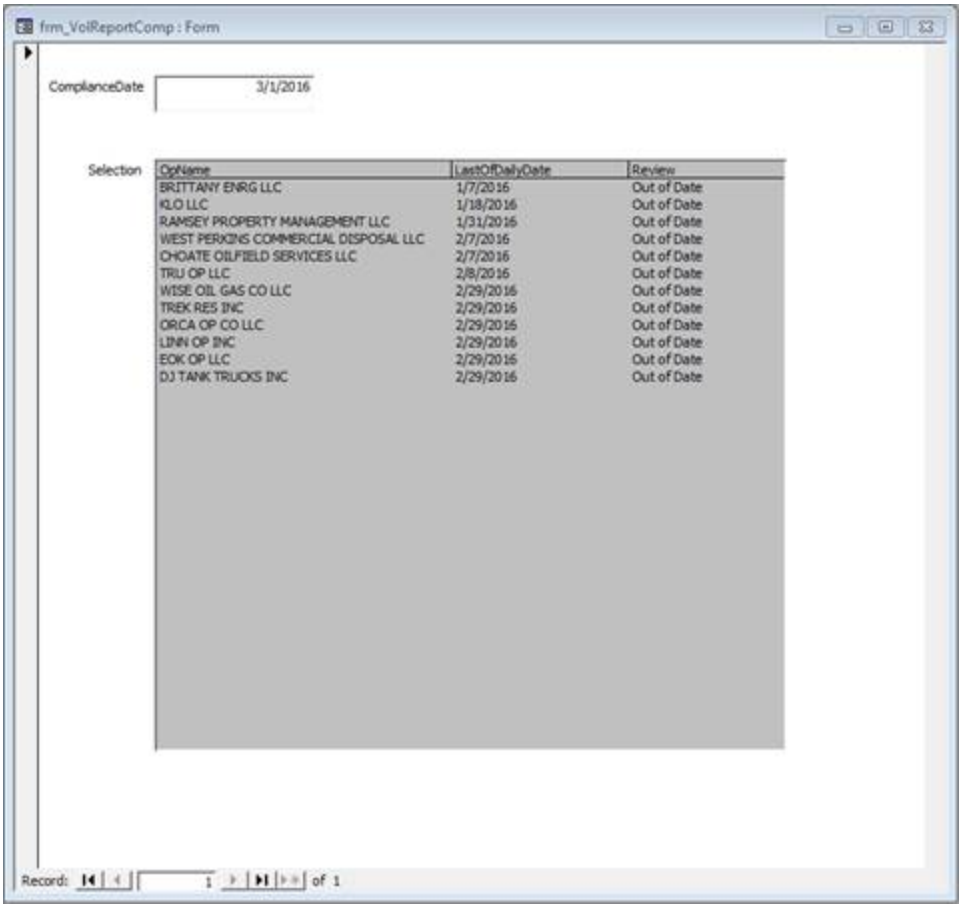
From: Phillip Bailey <P.Bailey@occemail.com>
Sent: Wednesday, April 13, 2016 10:02 AM
To: Dorsey, Nancy
Subject: RE: Access

Hi Nancy,

We've been making some headway on the database and have reached a point to where we need to use an update and append query to combine two tables containing daily volume data. Would you have anytime this week or next to have a virtual meeting where we can work in the database from our end?

Below are two screenshots of forms we have in the works to quickly check for volume compliance and volume reporting compliance.





Regards,

Phillip Bailey
Contract Geologist-Oil & Gas
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
(405) 522-6363
p.bailey@occemail.com

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, April 07, 2016 3:05 PM
To: Phillip Bailey; Jim Marlatt
Subject: Access

If you haven't already caught it ☺ , the connection between the UIC_WELLS14_KEY and the UIC_WELLS14_DEV_PTS should be between the API14 not the Well_Ident!

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches:
http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Hildebrandt, Kurt
Sent: Thursday, April 07, 2016 11:06 AM
To: Green, Holly; Kobelski, Bruce; Bates, William; Dellinger, Philip; Graves, Brian; Dorsey, Nancy; Johnson, Ken-E
Cc: Mindrup, Mary; Garrett, David; Meissner, Benjamin
Subject: FW: IMPORTANT - USGS Releases Earthquake Damage Hazard Map, KDHE Initiative

FYI – The following email was sent out from the Kansas Department of Health and Environment (KDHE) to the Class 1 well operators in the state concerning the recent USGS Earthquake Hazard Risk map along with information regarding an upcoming project in Kansas to gather background/baseline data related to seismic activities and Class 1 well operations and work with the industry to develop ways to minimize the risks of induced seismicity which may be caused by Class 1 operations.

From: Mike Cochran
Sent: Thursday, April 07, 2016 9:25 AM
To: Kansas Class 1 Well Operators
Subject: IMPORTANT - USGS Releases Earthquake Damage Hazard Map, KDHE Initiative

Good morning,

The United States Geological Survey (USGS) has released information that affects the Class I injection well community.

The information contained at this website is important: http://www.usgs.gov/blogs/features/usgs_top_story/induced-earthquakes-raise-chances-of-damaging-shaking-in-2016/ . Note that the United States Geological Survey has issued a one-year seismic hazard forecast map for the Central and Eastern United States, and for the first time this includes both human induced and natural earthquakes.

The USGS Earthquake Damage Hazard map shows the earthquake shaking hazard extending into southcentral Kansas. The induced seismicity has been correlated at this time to the deep disposal of oilfield produced brine.

Some of the conditions that have been identified as coinciding with injection induced seismicity include:

- A fault in the area, even if a number of miles away and even if only a basement fault. Many faults have not been mapped or their existence is otherwise unknown.
- Injection into formations near or adjacent to the basement rocks (such as the Arbuckle Formation).
- An increase in disposal reservoir pressure, even small amounts. It only takes a small amount of pressure build-up to trigger a fault in the basement. KGS stated they believe even a pressure increase of 1 psi is enough to change the stress regime at a fault and cause an earthquake. Gravity injection still results in reservoir pressure build-up as has been indicated by the pressure build-up calculations provided in support of the volume increase request.
- Injection into a focused geographical area.

- Exceeding some type of threshold. That is, injection may occur in an area for many years with no problems, but a change in operations occurring over a short time frame such as an increase in injection volume can exceed some type of threshold and the balance is then tipped towards seismicity.
- The injection volume does not have to be tremendous. Class II oilfield Injection wells receiving volumes of 210,000 gallons per day coincide with increased seismic activity in some areas.

This is a heads up that KDHE will be sending information in the near future to all Class I disposal well operators in Kansas in regards to injection induced seismicity. This includes a meeting KDHE plans to conduct, with participation by the Kansas Geological Survey, with all of the Class I operators to provide information on injection induced seismicity, to discuss the issue with industry, to receive input from industry and to solicit industry's assistance in addressing this issue.

KDHE envisions this assistance from industry would include seismic monitoring for a period of time. The purpose of this monitoring is to obtain background seismic data, monitor for the protection of Class I well infrastructure and other facility assets, to be proactive in demonstrating that Class I wells are not part of the problem, to prevent these wells from becoming part of the induced seismicity problem, to provide useful information for a better understanding of induced seismicity and to enhance protectiveness.

The Kansas Geological Survey and several concerned Class I operators are already working together to establish a consortium that would allow for cost sharing of seismic monitoring costs among the industry members. This will greatly enhance the usability of the data, as well as making this monitoring much more affordable for operators. The Kansas Geological Survey can be contracted to install and operate earthquake monitoring stations that meet data quality, reporting, and distribution requirements. Contracting with the Kansas Geological Survey to install and operate a permanent station or portable array allows data consistency and access to regional expertise and experience. The Kansas Geological Survey costs are very competitive, with considerable cost savings over using a private company to install a seismic monitoring station and to obtain the information.

If you have questions or need more information, please feel free to contact me.

Mike,

Mike Cochran
Professional Geologist
Chief, Geology and Well Technology Section
Bureau of Water
Kansas Department of Health and Environment
1000 SW Jackson Street, Suite 420
Topeka, KS 66612-1367
Telephone = 785.296.5560
Email = mcochran@kdheks.gov
Section Website = http://www.kdheks.gov/geo/index.html

Dorsey, Nancy

From: Dorsey, Nancy
Sent: Wednesday, March 30, 2016 8:11 AM
To: 'Murray, Kyle E.'
Subject: RE: Call?

Thanks Kyle!

-----Original Message-----
From: Murray, Kyle E. [mailto:kyle.murray@ou.edu]
Sent: Wednesday, March 30, 2016 8:06 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: Call?

Nancy,

Did you leave a voicemail for me? I'm in Ft Worth at a conference this week.

My estimate of the total volume of water used for drilling/hydraulic fracturing is 100 million barrels in 2011 (Murray ES&T, 2013)

My estimate of produced water volume in 2014 is 3 billion barrels (unpublished). There were about 1.5 billion barrels of SWD in 2014 (Murray, 2015) and about the same volume for EORI (2R) in 2013 (Murray, 2014).

I know these years are not all the same, but I assume the relative numbers are reasonable.

Therefore, the % of SWD that is frac flow back water would be no more than 3 to 6%.

Regards,
Kyle E. Murray, Ph.D.
Sent from my iPhone

Dorsey, Nancy

From: Boak, Jeremy M. <jboak@ou.edu>
Sent: Tuesday, March 29, 2016 3:53 PM
To: Dorsey, Nancy
Subject: Re: OGS quote on % of HF versus produced water disposed?

I sure understand that!

Jeremy Boak, Director
Oklahoma Geological Survey
Mewbourne College of Earth & Energy
University of Oklahoma
Sarkeys Energy Center, N119
100 E. Boyd Street
Norman OK 73019
405-325-7968
Jboak@ou.edu

From: "Dorsey, Nancy" <Dorsey.Nancy@epa.gov>
Date: Tuesday, March 29, 2016 at 3:51 PM
To: Jeremy Boak <jboak@ou.edu>
Subject: RE: OGS quote on % of HF versus produced water disposed?

☺ Understood! I have a long list of references and great articles. It is just trying to locate the one that had the quote needed…searching can take a while, particularly when you are looking at the wrong authors.

From: Boak, Jeremy M. [mailto:jboak@ou.edu]
Sent: Tuesday, March 29, 2016 3:50 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: Re: OGS quote on % of HF versus produced water disposed?
I began to recognize this, but every once in a while, someone has missed this paper!
Jeremy Boak, Director
Oklahoma Geological Survey
Mewbourne College of Earth & Energy
University of Oklahoma
Sarkeys Energy Center, N119
100 E. Boyd Street
Norman OK 73019
405-325-7968
Jboak@ou.edu

From: "Dorsey, Nancy" <Dorsey.Nancy@epa.gov>
Date: Tuesday, March 29, 2016 at 3:48 PM
To: Jeremy Boak <jboak@ou.edu>
Subject: RE: OGS quote on % of HF versus produced water disposed?
Thanks, I am actually very familiar with the topic.

From: Boak, Jeremy M. [mailto:jboak@ou.edu]
Sent: Tuesday, March 29, 2016 3:31 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: Re: OGS quote on % of HF versus produced water disposed?
Nancy

You may not have time right now, but the paper is a very good, relatively simple and straightforward description of the evidence for the earthquakes in Oklahoma being induced. I find myself using the figure regularly in presentations on Oklahoma earthquakes. And it is short!!

Jeremy Boak, Director
Oklahoma Geological Survey
Mewbourne College of Earth & Energy
University of Oklahoma
Sarkeys Energy Center, N119
100 E. Boyd Street
Norman OK 73019
405-325-7968
Jboak@ou.edu

From: "Dorsey, Nancy" <Dorsey.Nancy@epa.gov>
Date: Tuesday, March 29, 2016 at 3:27 PM
To: Jeremy Boak <jboak@ou.edu>
Subject: RE: OGS quote on % of HF versus produced water disposed?

Please don't blame Matt for my probable misquote, mainly he directed me to the correct source. Thank you for the response.

From: Boak, Jeremy M. [mailto:jboak@ou.edu]
Sent: Tuesday, March 29, 2016 3:25 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: Re: OGS quote on % of HF versus produced water disposed?

A paper by Rall Walsh and Mark Zoback in Science Advances in June (attached) calculated the fraction of waste water being disposed of that constituted flowback water from hydraulic fracturing operations. This would be fresh water that has been mixed with sand (8-10%) and chemicals (~0.5%) and injected into a shallower formation to fracture the rock. A portion of this water returns to the surface when the well is produced, and it is increasingly mixed with the natural water in the producing formation. The amount is less than 5%, according to Walsh and Zoback.

The remaining 95% of the water is formation water co-produced with oil and gas. It is essentially ancient seawater from the sedimentary rocks that also contain oil and gas. In the two main plays producing the bulk of the water disposed of in Oklahoma, it is saltier than Dead Sea water (and therefore toxic), but also contains some metals dissolved from adjacent rock, and some organic contaminants as a result of coexisting with oil and gas for millions of years.

Calling this hydraulic fracturing waste would be like calling coal fly ash from a power plant construction waste.

There is no difference between produced water from formations that are hydraulically fractured and formations that are not.

To my knowledge, there is no evidence that this calculation is not appropriate or is outdated. Matt Skinner is simply wrong on this issue.

The same proportion may not be true of other areas disposing of water from oil and gas operations.

Jeremy Boak, Director
Oklahoma Geological Survey
Mewbourne College of Earth & Energy
University of Oklahoma
Sarkeys Energy Center, N119
100 E. Boyd Street
Norman OK 73019
405-325-7968
Jboak@ou.edu

From: "Dorsey, Nancy" <Dorsey.Nancy@epa.gov>
Date: Tuesday, March 29, 2016 at 2:52 PM
To: Jeremy Boak <jboak@ou.edu>
Subject: OGS quote on % of HF versus produced water disposed?

My boss has asked me to verify a quote he remembered about the low percent of hydrofracturing produced water versus other produced water reinjected. Matt Skinner told me it came from OGS, but was out-dated. Will you assist me on this quest please?

FYI, the phone number listed for you on the website does not work.

Thank you,
Nancy
Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191
UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Approaches:
http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

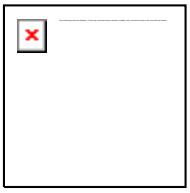
Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Friday, March 25, 2016 9:23 AM
To: Dorsey, Nancy
Subject: RE: 40_500 and 40_1000
Attachments: removed.txt

If they want ot go above that limit, they must schedule a technical meeting to discuss the reasons why more is need now, how long they need the increase, etc, and the OCC will make a determination on whether or not to allow the increase, and how much.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Friday, March 25, 2016 8:18 AM
To: Jim Marlatt
Subject: 40_500 and 40_1000

So any well in the area with <=500 BOPD (OKC, 1000 for N) for the 2014 annual average does not have to reduce? What about if they increase above that?

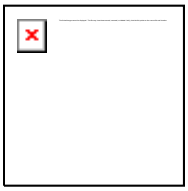
From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Thursday, March 24, 2016 3:25 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: Central well list question

Per day. We will be checking averages at intervals less than a month until the end of the reduction stages, then monthly averages going forward.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity

Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, March 24, 2016 11:04 AM
To: Jim Marlatt
Subject: RE: Central well list question

Per day, not per month?

From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Thursday, March 24, 2016 7:25 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Charles Lord <C.Lord@occemail.com>
Subject: RE: Central well list question

Nancy,

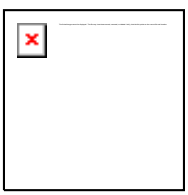
I did no tknow if you had an answer to this email, and I am trying to catch up today.

Plan 40_500 Allowed addresses the target of approximately 40% reduction from the 2014 total area volume, and 500 bpd are allowed without any reduction. All volumes above 500 bpd are reduced.

Plan Reduction BPD is the amount reduced from 2015 daily average.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, March 14, 2016 8:56 AM
To: Jim Marlatt
Cc: Charles Lord
Subject: Central well list question

Hi Jim,

I am testing out the spreadsheet to summarize the information on the daily worksheets. So I was looking for the Chesapeake wells as a test case in your Final_COK_Wells_JM2.xlsx. What do the column headers: Plan_40_500 Allowed Plan Reduction BPD mean?

In the meantime, I will go back and reread the letter. ☺

Thanks,
Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
Managing and Minimizing Potential of Injection-Induced Seismicity from Class II Disposal: Practical Appraches:
http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

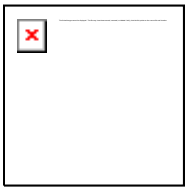
Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Thursday, March 24, 2016 3:25 PM
To: Dorsey, Nancy
Subject: RE: Central well list question
Attachments: removed.txt

Per day. We will be checking averages at intervals less than a month until the end of the reduction stages, then monthly averages going forward.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, March 24, 2016 11:04 AM
To: Jim Marlatt
Subject: RE: Central well list question

Per day, not per month?

From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Thursday, March 24, 2016 7:25 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Charles Lord <C.Lord@occemail.com>
Subject: RE: Central well list question

Nancy,

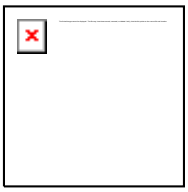
I did no tknow if you had an answer to this email, and I am trying to catch up today.

Plan 40_500 Allowed addresses the target of approximately 40% reduction from the 2014 total area volume, and 500 bpd are allowed without any reduction. All volumes above 500 bpd are reduced.

Plan Reduction BPD is the amount reduced from 2015 daily average.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, March 14, 2016 8:56 AM
To: Jim Marlatt
Cc: Charles Lord
Subject: Central well list question

Hi Jim,

I am testing out the spreadsheet to summarize the information on the daily worksheets. So I was looking for the Chesapeake wells as a test case in your Final_COK_Wells_JM2.xlsx. What do the column headers: Plan_40_500 Allowed Plan Reduction BPD mean?

In the meantime, I will go back and reread the letter. ☺

Thanks,
Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

UIC Webpages:
http://www.epa.gov/uic/underground-injection-control-epa-region-6-ar-la-nm-ok-and-tx
http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
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http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Thursday, March 24, 2016 3:24 PM
To: Dorsey, Nancy
Subject: RE: Central well list question
Attachments: removed.txt

Actual.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
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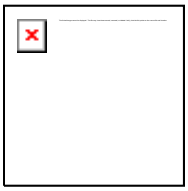

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, March 24, 2016 11:05 AM
To: Jim Marlatt
Subject: RE: Central well list question

Sorry, one more question wrt the 500 BPD, actual rate or permitted?

From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Thursday, March 24, 2016 7:25 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Charles Lord <C.Lord@occemail.com>
Subject: RE: Central well list question

Nancy,

I did no tknow if you had an answer to this email, and I am trying to catch up today.

Plan 40_500 Allowed addresses the target of approximately 40% reduction from the 2014 total area volume, and 500 bpd are allowed without any reduction. All volumes above 500 bpd are reduced.

Plan Reduction BPD is the amount reduced from 2015 daily average.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
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2101 N. Lincoln Boulevard, Room 214
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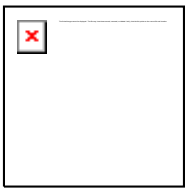

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, March 14, 2016 8:56 AM
To: Jim Marlatt
Cc: Charles Lord
Subject: Central well list question

Hi Jim,

I am testing out the spreadsheet to summarize the information on the daily worksheets. So I was looking for the Chesapeake wells as a test case in your Final_COK_Wells_JM2.xlsx. What do the column headers: Plan_40_500 Allowed Plan Reduction BPD mean?

In the meantime, I will go back and reread the letter. ☺

Thanks,
Nancy

Nancy S. Dorsey
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WQ-SG EPA Region 6
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http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Thursday, March 24, 2016 3:23 PM
To: Dorsey, Nancy
Subject: RE: Central well list question
Attachments: removed.txt

1000

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
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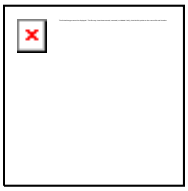

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, March 24, 2016 10:50 AM
To: Jim Marlatt
Subject: RE: Central well list question

Thanks Jim,

That makes sense. Is it the same cutoff for the northern area?

From: Jim Marlatt [mailto:J.Marlatt@occemail.com]
Sent: Thursday, March 24, 2016 7:25 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Cc: Charles Lord <C.Lord@occemail.com>
Subject: RE: Central well list question

Nancy,

I did no tknow if you had an answer to this email, and I am trying to catch up today.

Plan 40_500 Allowed addresses the target of approximately 40% reduction from the 2014 total area volume, and 500 bpd are allowed without any reduction. All volumes above 500 bpd are reduced.

Plan Reduction BPD is the amount reduced from 2015 daily average.

Thank you, and have a great day.

Jim Marlatt
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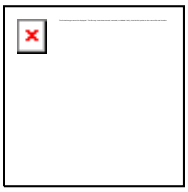

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
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To: Jim Marlatt
Cc: Charles Lord
Subject: Central well list question

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In the meantime, I will go back and reread the letter. ☺

Thanks,
Nancy

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FAX 214-665-2191

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http://www.epa.gov/uic/guidance-documents-completing-class-i-injection-well-no-migration-petitions
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Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Thursday, March 24, 2016 7:25 AM
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Cc: Charles Lord
Subject: RE: Central well list question
Attachments: removed.txt

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I did no tknow if you had an answer to this email, and I am trying to catch up today.

Plan 40_500 Allowed addresses the target of approximately 40% reduction from the 2014 total area volume, and 500 bpd are allowed without any reduction. All volumes above 500 bpd are reduced.

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Jim Marlatt
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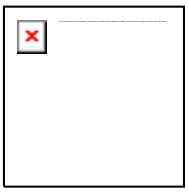

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Sent: Monday, March 14, 2016 8:56 AM
To: Jim Marlatt
Cc: Charles Lord
Subject: Central well list question

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In the meantime, I will go back and reread the letter. ☺

Thanks,

Nancy

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http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

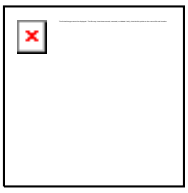
From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Thursday, March 24, 2016 7:20 AM
To: Dorsey, Nancy
Cc: Charles Lord
Subject: RE: WELL IN BOTH CENTRAL AND NORTHERN REDUCTION AREAS
Attachments: removed.txt

Nancy,

Not sure how it happened (okay, things may have been a little crazy here lately), but the Hardrow 1 should only be in the Central Oklahoma area.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, March 14, 2016 10:00 AM
To: Jim Marlatt
Cc: Charles Lord
Subject: WELL IN BOTH CENTRAL AND NORTHERN REDUCTION AREAS

Hi Jim,

Chesapeake's Hardrow 1 appears to be in both reduction areas. Does one take precedence?

Thanks,
Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
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http://www.epa.gov/uic/underground-injection-control-national-technical-workgroup-final-issue-papers

Dorsey, Nancy

From: Phillip Bailey <P.Bailey@occemail.com>
Sent: Thursday, March 10, 2016 8:35 AM
To: Dorsey, Nancy
Subject: RE: Adobe Connect - Meeting Invitation to "database discussion"
Attachments: OGCD_Seis_RPM.pdf; Field List.JPG

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, March 10, 2016 8:30 AM
To: Phillip Bailey
Subject: RE: Adobe Connect - Meeting Invitation to "database discussion"

It would be helpful to share visuals. I really wanted to test if we could use Adobe Connect or not. So maybe just a brief try then reschedule for everyone? The other option is Sharepoint, but I haven't set one of those up yet.

From: Phillip Bailey [mailto:P.Bailey@occemail.com]
Sent: Thursday, March 10, 2016 8:29 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: RE: Adobe Connect - Meeting Invitation to "database discussion"

I'll send you a scanned version of a 1st iteration of a data flow chart. Sure, can I call you at 9a to introduce myself and begin discussing. I'm not sure if I can gather the rest of the team in time though.

-----Original Appointment-----
From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, March 10, 2016 8:16 AM
To: Phillip Bailey
Subject: FW: Adobe Connect - Meeting Invitation to "database discussion"
When: Thursday, March 10, 2016 9:00 AM-10:00 AM (UTC-06:00) Central Time (US & Canada).
Where: https://epawebconferencing.acms.com/r5plgy31ee3/

Oh, I just noticed you had set the call for next week. Would this morning work?

-----Original Appointment-----
From: Dorsey.Nancy@epa.gov [mailto:Dorsey.Nancy@epa.gov]
Sent: Thursday, March 10, 2016 8:14 AM
To: Dorsey.Nancy@epa.gov; Dorsey, Nancy
Subject: Adobe Connect - Meeting Invitation to "database discussion"
When: Thursday, March 10, 2016 9:00 AM-10:00 AM (UTC-06:00) Central Time (US & Canada).
Where: https://epawebconferencing.acms.com/r5plgy31ee3/

Please join me in an Adobe Connect Meeting.

Meeting Name: database discussion
Summary:
Invited By: Nancy Dorsey (Dorsey.Nancy@epa.gov)
When: Thursday 10 March, 09:00 AM - 10:00 AM
Time Zone: (GMT-06:00) Central Time (US and Canada)

To join the meeting:
https://epawebconferencing.acms.com/r5plgy31ee3/

If you have never attended an Adobe Connect meeting before:

Test your connection: https://epawebconferencing.acms.com/common/help/en/support/meeting_test.htm

Get a quick overview: http://www.adobe.com/products/adobeconnect.html

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Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Monday, March 07, 2016 12:19 PM
To: Dorsey, Nancy; Matt Skinner
Cc: Charles Lord; Tim Baker
Subject: RE: advisory, etc

Yes, the Cushing area. The letter was dated the 16th, the release came out on the 19th.

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, March 07, 2016 9:57 AM
To: Matt Skinner
Cc: Jim Marlatt; Charles Lord; Tim Baker
Subject: RE: advisory, etc

Thanks, what is the October 16, 2015 reduced volume letter mentioned? Was that supposed to be 10/19/15 Cushing area?

AOI_Actions	
AOI_Act_Date	**AOI_Action**
10/10/2014	Cushing
3/18/2015	First AOI Directive
6/17/2015	Olmstead
7/15/2015	Second AOI Directive
7/28/2015	Crescent
8/3/2015	Logan Trend (Ok, Logan, Lincoln, Payne)
9/17/2015	Cushing
9/18/2015	Cushing
10/19/2015	Cushing
11/10/2015	Medford
11/16/2015	Fairview
11/19/2015	Cherokee-Carmen
11/20/2015	Crescent
12/3/2015	Medford
12/3/2015	Byron-Cherokee
1/4/2016	Edmond
1/13/2016	Fairview-Cherokee-Medford
1/20/2016	Settlement: Medford, Bryon-Cherokee
2/16/2016	Western AOI (NW OK) Directive
3/7/2016	Central AOI Directive

From: Matt Skinner [mailto:M.Skinner@occemail.com]
Sent: Monday, March 07, 2016 9:34 AM
To: Matt Skinner <M.Skinner@occemail.com>
Subject: advisory, etc

Please see attached. Due to go out within the next 10 minutes

Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Friday, March 04, 2016 7:04 PM
To: Dorsey, Nancy
Subject: FW: Central Oklahoma Area of Reduction
Attachments: removed.txt; AOI Expansion March 7 2016.pdf; COK Volume Reduction March 7 2016.pdf; Summary Operator List.pdf; Advance_Schedule.pdf

Nancy,

The latest reduction plan. Expanded AOI going out next week, then things should settle down. Have a great weekend.

Jim

From: Jim Marlatt
Sent: Friday, March 04, 2016 4:59 PM
To: 'Michael Teague'; 'Tom Robins'; Joyce Boyd; Joseph Briley; Nicole King; 'Chad Warmington'; 'Kim Hatfield'
Cc: Tim Baker; Charles Lord; Matt Skinner; Jefferson Chang (jeffersonchang@ou.edu); 'Boak, Jeremy M.'; 'Murray, Kyle E.'
Subject: Central Oklahoma Area of Reduction

Good afternoon,

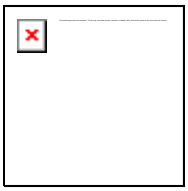
Attached is a summary of the Central Oklahoma Volume Reduction. Attempts have been made to contact all operators, and emails will be sent prior to Monday's release of the plan to the media. The operators will be receiving the following email message, along with the attachments, tailored to only their wells. All operators will be emailed the information this evening, if there is an email address available. They will receive a schedule showing the target total daily volume for each stage of the reduction, as well as the barrels per day reduced, as shown for Advance Oil Corp in the attachment included.

> Good day,
>
> Due to continued seismic activity across the State of Oklahoma, the Oil and Gas Conservation Division (OGCD) is implementing an expanded area of reduction for all disposal wells listed as disposing into the Arbuckle. Your company has been identified as operating one or more wells in the area of reduction. The attached letter, map and schedule for reduction provides the details for this plan.
>
> If you have wells which were not included in either the March 18, 2015 and/or the July 15, 2015 letters, outlining the requirements for wells within the Area of Interest for triggered seismicity, you are being required to show logs or other geologic proof that the well is not beyond the Arbuckle formation. These details are included in the attachment titled AOI Expansion March 7 2016, for you to review. Please provide a PDF or other electronic file containing this proof within 15 days to j.marlatt@occemail.com .

Please refer to the instructions in the letter for any questions, or to schedule a technical conference.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



I will be out of the office Monday until noon, so any questions concerning you may have regarding this matter should be directed to Charles Lord or Tim Baker.

Thank you, and have a great weekend.

Jim Marlatt
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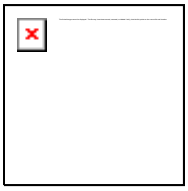


Dorsey, Nancy

From: Hildebrandt, Kurt
Sent: Thursday, March 03, 2016 10:09 AM
To: Dorsey, Nancy; Bates, William; Graves, Brian; Johnson, Ken-E; Dellinger, Philip
Subject: RE: 2016-03-02 23:31:48 (M4.3) OKLAHOMA 36.5 -98.7 (63093)

Apparently, KCC met with a couple of oil companies earlier this week about the expanded limited injection area that has been proposed by KCC and is going to bump up upper limit from the proposed 8,000 barrels per day to 12,000 barrels per day in the expanded area. However, in return they are going to get access to a bunch of subsurface and well information from one of the companies for KGS to use in their modelling efforts in the area.

More information as I find out about it.

From: Dorsey, Nancy
Sent: Thursday, March 03, 2016 9:13 AM
To: Bates, William ; Hildebrandt, Kurt ; Graves, Brian ; Johnson, Ken-E
Subject: RE: 2016-03-02 23:31:48 (M4.3) OKLAHOMA 36.5 -98.7 (63093)

This quake is in the area already under the Western plan—with the delayed start.

From: Bates, William
Sent: Thursday, March 03, 2016 9:12 AM
To: Hildebrandt, Kurt <Hildebrandt.Kurt@epa.gov>; Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Graves, Brian <Graves.Brian@epa.gov>; Johnson, Ken-E <Johnson.Ken-E@epa.gov>
Subject: RE: 2016-03-02 23:31:48 (M4.3) OKLAHOMA 36.5 -98.7 (63093)

At a meeting with IOGCC yesterday, someone mentioned that OK is getting ready to set another area of limited injection rates. I am curious if it going to be in the location of this quake.

William J. L. Bates
Geologist
U.S. EPA
Office of Ground Water & Drinking Water: Prevention Branch
202-564-6165

From: Hildebrandt, Kurt
Sent: Thursday, March 03, 2016 9:38 AM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>; Bates, William <bates.william@epa.gov>; Graves, Brian <Graves.Brian@epa.gov>; Johnson, Ken-E <Johnson.Ken-E@epa.gov>
Subject: RE: 2016-03-02 23:31:48 (M4.3) OKLAHOMA 36.5 -98.7 (63093)

Quakes happen?

From: Dorsey, Nancy
Sent: Thursday, March 03, 2016 8:15 AM
To: R6 6WQ-SG <R6_6WQSG@epa.gov>; Hildebrandt, Kurt <Hildebrandt.Kurt@epa.gov>; Bates, William <bates.william@epa.gov>
Cc: Brown, Jamesr <brown.jamesr@epa.gov>
Subject: FW: 2016-03-02 23:31:48 (M4.3) OKLAHOMA 36.5 -98.7 (63093)

So much for slowly decreasing the rate.

From: USGS ENS [mailto:ens@ens.usgs.gov]
Sent: Wednesday, March 02, 2016 5:42 PM
To: Dorsey, Nancy <Dorsey.Nancy@epa.gov>
Subject: 2016-03-02 23:31:48 (M4.3) OKLAHOMA 36.5 -98.7 (63093)

M4.3 - OKLAHOMA

Preliminary Earthquake Report	
Magnitude	4.3
Date-Time	2 Mar 2016 23:31:49 UTC 2 Mar 2016 17:31:49 near epicenter 2 Mar 2016 16:31:49 standard time in your timezone
Location	36.463N 98.732W
Depth	4 km
Distances	31 km (19 mi) NW of Fairview, Oklahoma 59 km (36 mi) E of Woodward, Oklahoma 76 km (47 mi) W of Enid, Oklahoma 103 km (63 mi) N of Weatherford, Oklahoma 155 km (96 mi) NW of Oklahoma City, Oklahoma
Location Uncertainty	Horizontal: 2.0 km; Vertical 3.3 km
Parameters	Nph = 62; Dmin = 1.9 km; Rmss = 0.21 seconds; Gp = 62° Version =
Event ID	us 10004u7w

For updates, maps, and technical information, see: Event Page or USGS Earthquake Hazards Program

Disclaimer

This email was sent to dorsey.nancy@epa.gov

You requested mail for events within the 'R6 plus CO' region
for M1.0 between 08:00 and 20:00 and M1.5 other times.

To change your parameters, go to:

https://sslearthquake.usgs.gov/ens

To unsubscribe, send a one-line reply to this message with:

STOP dorsey.nancy@epa.gov

Dorsey, Nancy

From: Tim Baker <T.Baker@occemail.com>
Sent: Wednesday, March 02, 2016 3:23 PM
To: Dorsey, Nancy
Subject: Critical Concerns

Dear Nancy,

As you know, we are in the midst of an effort to get another large regional plan in place, with all the resources currently available committed to its completion. I greatly appreciate your support of these efforts, and know you are in agreement that completion of the current plan should get the top priority.

Therefore we have only been able to do a quick check of the very critical concerns you have raised. The initial indication is that at least part of the problem may involve an “apples and oranges” issue when it comes to applying the data at issue.

Regardless, these issues need to be thoroughly addressed at the earliest possible opportunity, and I know that as in the past, we will work together to get that done. As soon as the new plan is in place, we will set up a meeting with you to go over these concerns in full detail. As always, I am indebted to you for your continued work in support of the Division.

Thanks.
Tim

Dorsey, Nancy

From: Larry Meysing <meysing.larry@gene.com>
Sent: Wednesday, March 02, 2016 8:45 AM
To: Dorsey, Nancy
Cc: meysing.larry@gene.com; Dellinger, Philip; Overbay, Michael
Subject: Re: Wastewater Injection Disposal Sites; Oil Industry

Dear Ms. Dorsey.

Thank you for response to my inquiry about EPA jurisdiction over wastewater injection sites and disposal activity in OK. My delay in responding is due to additional research on alternatives to wastewater injection for disposal of toxic wastewater caused by fracking.

It concerns me that the EPA is putting its reputation at risk by deferring to the OCC for wastewater disposal regulation. Please see my letter to Senators Lankford and Inhofe below. The OCC has allowed the oil industry to violate "wastewater reduction requests" and truck wastewater from neighboring states into OK for disposal. Ultimately, the OCC is like a guard dog with no teeth, since it has no real power to enforce its regulations.

> Dear Senator Lankford.
>
> The AP article below does a great job of summarizing the concerns I expressed in my original letter to you. The OK government's failure to effectively regulate man made earthquakes caused by wastewater injection sites is now gaining national media attention.
>
> The article by Weingarten et al, posted on the USGS website shows that there are approximately 34,000 wastewater injection sites (aka Salt Water Disposal-SWD sites) in the state of OK. The oil industry could afford to close all sites within 50 miles of residential areas and known faults. Even if this meant closing over 1000 SWD sites, the oil industry would still have at least 33,000 wastewater sites to work with. As the AP article below states, the current partial reductions in 90 wells by the OCC has been a failure.
>
> Without the closing of at least 1000 wastewater injection sites, why would the oil industry begin to invest in the only environmentally responsible solution to wastewater disposal, which is treatment plants and evaporators (see link below).
>
> 
>
> http://www.waterworld.com/articles/iww/print/volume-15/issue-2/features/desalination-trends-in-the-oil-and-gas-industry.html

I also find the paragraph from the AP article below to be the most telling as to why Governor Fallin refuses to act and hides behind the OCC's failed approach. When you have the president of an oil company on your task force "studying the earthquake problem", how can you acknowledge what is really causing the earthquake problem. This is a blatant conflict of interest clearly identified in the AP article.

"But oil and gas operators in Oklahoma, where the industry is a major economic and political force, acknowledge their resistance to cutting back on their injections of wastewater.
"A lot of people say we just need the earth to stop shaking, and I understand that, but the fact of the matter is that without the ability to dispose of wastewater, we cannot produce oil and gas in the state of Oklahoma, and this is our lifeblood," said Kim Hatfield, president of Oklahoma City-based Crawley Petroleum and a member of Gov. Mary Fallin's task force studying the earthquake problem."
I wanted to make sure I documented that you and Senator Inhofe have this information. Hopefully you will do the right thing with it for OK homeowners and taxpayers by enacting legislation to close wastewater injection sites near known faults and residential areas.

Thank you.

In closing, it would be embarrassing if deferring to the OCC results in a bad PR situation for the EPA similar to the drinking water issue in Flint, MI. I request that the EPA begin a careful review of the OCC's actual enforcement of the regulations they are "requesting" of the oil industry. With 34,000 active wastewater disposal sites in OK (Weingarten et al; USGS website); I am amazed that the EPA is not motivating the oil industry to move toward more environmentally sustainable ways of dealing with toxic wastewater. I realize the oil industry is in a tough economic situation, but they should be pushed toward change while natural gas production is at its lowest.

I wanted to make sure there is documentation that you have received the same information and requests that I shared with our OK Senators. They have responded with form letters trying to confuse the issue by focusing on data showing that hydraulic fracking itself doesn't cause earthquakes. I assume those letters were written for them by the oil industry.

Again, thank you for your response.

Larry

Larry Meysing
(405) 323-9882

On Jan 28, 2016, at 12:20 PM, Dorsey, Nancy <Dorsey.Nancy@epa.gov> wrote:

> Dear Mr. Meysing,
> Thank you for your inquiry regarding injection induced earthquakes in Oklahoma. In your inquiry, you request EPA to intervene in this matter. Consistent with Congressional intent under the Safe Drinking Water Act of 1974, the Underground Injection Control Program for oil and gas related injection wells in Oklahoma was delegated to the Oklahoma Corporation Commission (OCC) in 1981. As such, OCC is responsible for regulation of oil and gas related injection wells to protect underground sources of drinking water, including risks from

injection induced seismicity. EPA maintains oversight responsibility of this delegated program.

EPA shares your concern about the ongoing seismic activity in Oklahoma. Under oversight authority, EPA has been providing technical support and recommendations to the OCC in an effort to address risks to USDWs posed by injection induced seismicity. EPA also developed a report[1] released in February 2015, to provide strategies and recommendations for states to address injection induced seismicity. Although OCC has implemented several actions consistent with this report, EPA recommended further action in its 2014 End of Year Evaluation Report for the OCC program, released in September 2015. These recommendations included further reductions of injection volumes into the Arbuckle Formation and geologic assessment of the Arbuckle to determine if pressure increases from injection into the Arbuckle are communicating with stressed faults in basement rocks.

Many of OCC's actions responding to magnitude 4 earthquakes have been in the nature of requests to the disposal operators, in part because the OCC does not have explicit rules with respect to earthquakes caused or potentially caused by UIC operations. So far, all of the operators have honored these requests, though in some cases through a modified agreement. The Oklahoma legislature would be the most effective agency to provide OCC the authority and mandate to increase their response to ongoing seismicity.

EPA is closely monitoring the ongoing seismic activity, including trends in frequency and magnitude of seismic events, and continues to offer technical support and recommendations to the OCC. If you have questions, please contact me, information below, or my supervisor Phil Dellinger at 214-665-2294.

Sincerely,

Nancy Dorsey
Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager
WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
214-665-2294
FAX 214-665-2191

From: Larry Meysing [mailto:meysing.larry@gene.com]
Sent: Wednesday, December 30, 2015 12:13 PM
To: Okpala, Maria
Cc: Larry Meysing
Subject: Wastewater Injection Disposal Sites; Oil Industry

Hello Maria.

This is to inquire if the EPA has jurisdiction over wastewater disposal from the oil industry, specific to wastewater injection disposal sites and their scientifically proven impact on earthquake activity.

After 2 years of home damaging earthquakes, I am convinced that the State of OK is purposefully following a path that will never prove the cause and effect of wastewater injection disposal sites causing earthquakes, so that the state doesn't have to regulate the oil industry on wastewater injection disposal sites. The State of OK could require the closing of any wastewater injection disposal site on a known fault line or within 50 miles of a residential area. This inaction or possible coverup by Governor Mary Fallin and Corporation Commission Chair, Bob Anthony, is allowing oil companies higher profits through cheap wastewater disposal, at the cost of relentless damage to taxpayers homes caused by earthquakes. Wastewater could be disposed of through treatment plants, but that would cost the oil industry more money, reducing their profits.

Please review the following links. I would call your attention to the map in the first link showing the unchecked results of numerous earthquakes in OK, compared to our border states. I would also call your attention to the article titled; High-rate injection is associated with the increase in U.S. mid-continent seismicity, by authors Weingarten, et al. I have referenced this data in a letter to Chairman Anthony and Governor Fallin and received no response to date.
The second link is to an article explaining the difference between wastewater injection disposal versus regular fracking from our neighboring state of TX. The oil industry tries to confuse the issue by lumping wastewater disposal and fracking together. Both links have been shared with Chairman Anthony and Governor Fallin with no response to date.

http://earthquake.usgs.gov/research/induced/
https://stateimpact.npr.org/texas/tag/earthquake/
I have attached a copy of my letter to Chairman Anthony regarding the request to shut down wastewater injection disposal sites on known fault lines and within 50 miles of residential areas. I find it interesting that Chairman Anthony of the OK Corporation Commission has posted a slide presentation defending oil industry hydraulic fracking on the OCC state website.
Thanks.
Larry Meysing
(405) 657-2373
lmeysing@yahoo.com

[1] http://www.epa.gov/sites/production/files/2015-08/documents/induced-seismicity-201502.pdf

Dorsey, Nancy

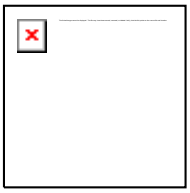
From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Monday, February 22, 2016 3:56 PM
To: Dorsey, Nancy; Charles Lord
Subject: RE: details to go with 7/28/2015 Crescent reduction?
Attachments: removed.txt

Nancy,

There was not a spreadsheet, just phone calls to the operators, who voluntarily shut in or reduced. The wells were the Cat in the Hat 2-19, the Chambers 1-8 (now US Energy Development Corp, but were Stephens Energy at the time) and the Hopfer 1-20 (Devon). The Hopfer need to plug back, Chambers was shut in due to proximity to EQ and optimally oriented fault, and the Cat in th e Hat was reduced 50%. All have since been restored to previous levels.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
j.marlatt@occemail.com



From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Monday, February 22, 2016 3:17 PM
To: Charles Lord; Jim Marlatt
Subject: details to go with 7/28/2015 Crescent reduction?

Hi guys,

I was trying to locate the release or spreadsheets or anything listing the actual request to operators for the late July 2015 Crescent M4. Would you tell me where I can find it or send it to me? Pretty please?

Thanks,
Nancy

Nancy S. Dorsey
Environmental Scientist
Oklahoma Class II Program Manager

WQ-SG EPA Region 6
1445 Ross Ave. #1200
Dallas, TX 75202-2733
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July 28, 2015 – Crescent: 2 wells shut in, 1 reducing volume 50 percent.
http://www.occeweb.com/News/Crescent%20wells.pdf

Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Friday, February 19, 2016 7:56 AM
To: Dorsey, Nancy; Charles Lord
Subject: RE: new NW OK list ?

Nancy,

The Perry and R R Cattle are terminated. The Millege pulled in as an Arbuckle well but is actually a gas storage.

Thanks

Jim

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, February 17, 2016 8:57 AM
To: Jim Marlatt; Charles Lord
Subject: new NW OK list ?

These three wells are either PA or not UIC….no images under 1012/1075/1072 at all.

qry_NWOK			
OpName	**API**	**WellName**	**WellNum**
MCQUEEN ED CO INC	3509322120	PERRY	1 3
PANHANDLE EASTERN PIPE LINE COMPANY LP	3515120694	MILLEGE	2 23
SAVOY EXPL LP	3500321882	R R CATTLE	1 19

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Dorsey, Nancy

From: Jim Marlatt <J.Marlatt@occemail.com>
Sent: Friday, February 19, 2016 7:51 AM
To: Dorsey, Nancy; Charles Lord
Subject: RE: NW wells?
Attachments: removed.txt; NW_OK_Inclusion_from ND.xlsx

Nancy,

The list you found was the master list of all wells in the reduction area, while the list released was without the wells which were either already identified as Not in Arbuckle, or they were a part of the Sandridge agreement. The Sandridge agreement still stands for the other wells.

Thank you, and have a great day.

Jim Marlatt
Oil and Gas Specialist - Seismicity
Oklahoma Corporation Commission
2101 N. Lincoln Boulevard, Room 214
Oklahoma City, OK 73105
405.522.2758
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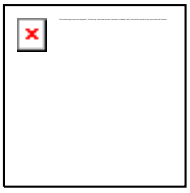

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, February 17, 2016 9:38 AM
To: Jim Marlatt; Charles Lord
Subject: NW wells?

Hi guys,

I was comparing the official release to the list I found, and noticed a number of wells weren't listed. Also, several of those listed had two wells with the same name, so I assume both were included?

Are the wells on the attachment within the reduction zone? Are they part of the action?

How does this affect the previous agreement with Sandridge?

Thanks,
Nancy

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Dorsey, Nancy

From: Matt Skinner <M.Skinner@occemail.com>
Sent: Wednesday, February 17, 2016 2:31 PM
To: 'Dorothy Coker'
Subject: RE: Information requested

Sorry, but again, no way of knowing. We can't really even estimate, and I'm sure you can understand that we aren't in the guessing business. We find wells regularly that we have no records on that pre-date our "modern" jurisdiction.
I can and will get you the 2013 UIC data for permits granted.

From: Dorothy Coker [mailto:DCoker@mahaffeygore.com]
Sent: Wednesday, February 17, 2016 2:25 PM
To: Matt Skinner
Cc: Richard J. Gore
Subject: RE: Information requested

Quick reply! My revisions are in red below and, hopefully, clearer. Thanks, Matt.

Dorothy

From: Matt Skinner [mailto:M.Skinner@occemail.com]
Sent: Wednesday, February 17, 2016 2:09 PM
To: Dorothy Coker
Subject: RE: Information requested

Fracking

1) I don't know where how you could determine a date. Fracking has been routinely done in Oklahoma for more than 60 years – then during the past 60 years, approximately how many wells have been hydraulically fractured in OK – I realize this is a rough, rough estimate.
2) I don't know exactly what you mean by "fractured treated well" as there is no such term. I assume you mean whether or not the completion process of hydraulic fracturing (which is done after drilling and before production) was done on a well that produced after the process. The vast majority of wells that eventually produced in Oklahoma underwent some form of the process (see #1).

Disposal

1) As with fracturing, I do not know how you could ascertain that. The use of disposal wells pre-dates Commission jurisdiction in that regard.
2) I will get that data from the UIC (Underground Injection Control) dept.
3) By "authorized," do you mean who many wells were granted permits during that time period, or how many wells held a permit during that period? Yes, I mean how many permits were granted on or after January 1, 2013 to the present?

From: Dorothy Coker [mailto:DCoker@mahaffeygore.com]
Sent: Wednesday, February 17, 2016 1:50 PM
To: Matt Skinner

Cc: Richard J. Gore
Subject: Information requested

Matt –

I have searched the OCC, EPA and other websites, but cannot find the following facts/statistics regarding:

Disposal Wells:

1. Date, Name and Place of first disposal well in Oklahoma;
2. Total number of disposal wells in Oklahoma from January 2012 through December 31, 2012; and
3. Number of disposal wells authorized by OCC since January 1, 2013;

Fracking:

1. Date, Name and Place of first well fractured treated in the U.S. and
2. How many fractured treated wells have been drilled in the U.S since that date?

I would appreciate it if you have or could direct me to someone (or some site) who has this information. Thank you.

Respectfully,

MAHAFFEY & GORE

Dorothy Coker, Legal Assistant
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Phone: 405.236.0478 X 211
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Dorsey, Nancy

From: Matt Skinner <M.Skinner@occemail.com>
Sent: Wednesday, January 13, 2016 10:38 AM
To: Dorsey, Nancy
Subject: FW: earthquakes and power outage
Attachments: 01-13-16FIRST PAGE.PDF

Importance: High

Hasn't gone out yet – draft is attached

From: Dorsey, Nancy [mailto:Dorsey.Nancy@epa.gov]
Sent: Wednesday, January 13, 2016 10:11 AM
To: Jim Marlatt; Matt Skinner
Subject: earthquakes and power outage
Importance: High

Hi Jim and Tim,

I know that Charles is tied up in meetings. He called me earlier and told me about the new press release. It talks about the earthquake being caused by the wells coming back on after the power outage. I thought the ice and an earthquake caused it, but the timing doesn't work if the wells where shut down from the 27-29. Where there two power outages?

Thanks for clarifying!
Nancy

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